Identifying chronic widespread pain in primary care: a medical record database study

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Abstract

Chronic widespread pain (CWP) is common and associated with poor health. In general practice no morbidity code for CWP exists. By identifying patients in medical records consulting regularly over five years with multiple individual regional (axial, upper limb, lower limb) problems, a previous study identified patients in one practice with features consistent with CWP. This suggests patients regularly consult for regional pains without being recognised, or managed, as having a generalised condition. The original criteria for identifying these recurrent regional consulters (RRCs) had limitations including a restricted set of musculoskeletal morbidity codes.

This thesis aimed to develop the existing RRC definition, determine characteristics of RRCs, and assess the extent of unrecognised CWP in primary care. The study was set in: i) a general practice database; ii) a cohort with linked self-reported health and medical records.

RRCs were identified using different code lists, over altered timeframes, and with a varied number of recorded body regions. Three-quarters of RRCs were not recorded with a generalised pain code related to CWP (e.g. fibromyalgia) and are therefore potentially unrecognised as having a generalised pain condition. Recorded prevalence of recognised CWP was lower than community CWP prevalence, suggesting CWP is under-recognised in primary care.

The new approach to identifying RRCs, using all regional musculoskeletal Read codes and identifying patients prospectively between three and five years from an index musculoskeletal consultation, identified more patients earlier, and returned patients with features consistent with self-reporting of CWP (e.g. increased somatic symptoms, frequent consultation, worse general health). However, RRC prevalence overestimated CWP prevalence and not all RRCs self-reported CWP, suggesting the RRC criteria identified a heterogeneous group of frequent consulters sharing features with CWP, including those less severely affected who do not necessarily fit established CWP criteria. They nonetheless lie on the spectrum of polysymptomatic distress characteristic of CWP.

Glossary and abbreviations

Term	Definition
ACR-90	The American College of Rheumatology criteria for CWP/FM (Wolfe et al. 1990). CWP is defined as pain lasting three months or longer, located axially (cervical spine, thoracic spine, anterior chest or low back), above and below the waist, and on the left and right sides of the body. FM diagnosis requires CWP and 11 out of 18 specific tender points.
ACR-2010	The 2010 revised American College of Rheumatology FM criteria (Wolfe et al. 2010). FM is defined as either: i) WPI≥7 and SS≥5; or ii) WPI 3–6 and SS≥9.
AS	Ankylosing spondylitis
CI	Confidence interval
CiPCA	Consultations in Primary Care Archive. A dataset containing anonymised primary care consultation data from 10 to 14 (depending on year) general practices in the North Staffordshire area of the UK.
Consultation-based CWP	CWP cases defined using primary care consultation patterns for specific musculoskeletal pain complaints.
CWP	Chronic widespread pain: This refers to unexplained, longstanding, diffuse body pain. It is the characteristic feature of fibromyalgia. It has been most widely studied using the 1990 ACR criteria (Wolfe et al. 1990) and is often associated with multiple somatic symptoms (Aggarwal et al. 2006).
FA	Frequent attender/attendance.
FM	Fibromyalgia
IQR	Inter-quartile range
Manchester criteria	Alternative criteria for CWP (Hunt et al. 1999). Like the ACR-90 pain must be present in at least two contralateral body quadrants, however, to reflect a more diffuse pattern of pain, for a body quadrant to be deemed positive, pain must be present in at least two regions of that quadrant.
NES	Not elsewhere specified. Used in Read code clinical terms.
NOS	Not otherwise specified. Used in Read code clinical terms.
NorStOP	North Staffordshire Osteoarthritis Project (Thomas et al. 2004b). A large prospective cohort study of people aged 50 and over. Respondents were recruited from the registered populations of six general practices from the Keele GP Research Partnership which is supported by the North Staffordshire Primary Care Research Consortium. Baseline, three-year and six-year demographic, generic and musculoskeletal postal questionnaire responses have been collected (Thomas et al. 2004a, Thomas et al. 2004b, Thomas et al. 2007, Jordan et al. 2008). These responses have been linked to the medical records of those respondents who consented.
MS	Musculoskeletal
NS	Non-specific pain. Used to describe Read codes for non-specific pain which could represent CWP coding. Non-specific coding was used as a proxy for recognised CWP coding.
OA	Osteoarthritis
OR	Odds ratio
PMR	Polymyalgia rheumatica

Term	Definition
QOF	Quality and Outcomes Framework. Following the introduction of the new General Medical Services contract in 2004, substantial financial rewards were linked to a number of quality indicators (Doran et al. 2006, Sutton & McLean 2006). The contract increased practice income based on performance in areas of 'quality' identified in the Quality and Outcomes Framework (QOF). The QOF identified 146 clinical and organisational benchmarks (Doran et al. 2008, Guthrie et al. 2006). Quality points were accrued by evaluation of a limited list of Read codes from practice records (Williams and de Lusignan 2006).
RA	Rheumatoid arthritis
Rohrbeck criteria	The consultation-based CWP criteria defined by Jens Rohrbeck, (Rohrbeck 2002, Rohrbeck et al. 2007). Requires a pattern of consultations for specific Read codes over a five-year period.
Rohrbeck-2002	First consultation-based CWP criteria proposed by Rohrbeck (2002), uses the same consultation pattern as Rohrbeck-2007 criteria and also includes an age specification and individuals recorded with FM or fibrositis codes.
Rohrbeck-2007	Using primary care consultation data and a list of 147 Read codes (appendix A5.1), Rohrbeck-2007 RRCs need the following consultation pattern: In a period of 5 consecutive years fulfil all of i)–iv): i) at least 1 consultation for a musculoskeletal complaint in the axial skeleton (neck & back); ii) at least 1 consultation for an upper or lower limb complaint iii) at least 1 consultation for a regional musculoskeletal complaint in each of 3 separate years; iv) at least 4 consultations for regional musculoskeletal complaints in total during the 5 year period.
RRC	Recurrent Regional Consulter. Patients with repeated regional musculoskeletal consultations. Defined initially using the Rohrbeck-2007 consultation-based CWP criteria. Definition developed throughout this thesis.
RRC-all	Recurrent regional consulters identified using a list of all regional musculoskeletal Read codes.
RRC-clinician	Recurrent regional consulters identified using a list of all regional musculoskeletal Read codes excluding those identified by an advisory panel of clinicians as being unlikely to represent CWP.
RRC-Rohrbeck	Recurrent regional consulters identified using the original list of 147 musculoskeletal pain Read codes identified by Rohrbeck (2007).
RRC-all-2	Recurrent regional consulters identified using a list of all regional musculoskeletal Read codes. Recorded as consulting in two body regions only: axial and upper limb, or axial and lower limb.
RRC-all-3	Recurrent regional consulters identified using a list of all regional musculoskeletal Read codes. Recorded as consulting in all three body regions: axial, upper limb and lower limb.
RRC-clinician-2	Recurrent regional consulters identified using a list of all regional musculoskeletal Read codes excluding those identified by an advisory panel of clinicians as being unlikely to represent CWP. Recorded as consulting in two body regions only: axial and upper limb, or axial and lower limb.
RRC-clinician-3	Recurrent regional consulters identified using a list of all regional musculoskeletal Read codes excluding those identified by an advisory panel of clinicians as being unlikely to represent CWP. Recorded as consulting in all three body regions: axial, upper limb and lower limb.
RRC-Rohrbeck-2	Recurrent regional consulters identified using the original list of 147 musculoskeletal pain Read codes identified by Rohrbeck (2007). Recorded as consulting in two body regions only: axial and upper limb, or axial and lower limb.
RRC-Rohrbeck-3	Recurrent regional consulters identified using the original list of 147 musculoskeletal pain Read codes identified by Rohrbeck (2007). Recorded as consulting in all three body regions: axial, upper limb and lower limb.

Term	Definition
Search strategy	This term is used in two different contexts in this thesis: i) with reference to the systematic review it is: the set of search terms used to search for relevant papers within a medical reference database such as Medline; and ii) with reference to general practice electronic data this refers to this refers to the consultation-based definitions of CWP, for example the RRC definition or Rohrbeck's original criteria.
sd	Standard deviation
SLE	Systemic lupus erythematosus
SS	Symptom Severity: 0–12 measure of severity of somatic symptoms used in the ACR-2010 criteria. Fatigue, waking unrefreshed and cognitive symptoms are assigned a score between zero (no problem) and three (severe problem). The number of somatic symptoms reported are also scored from zero (no symptoms) to three (a great deal of symptoms). The scores for the three individual symptoms (fatigue, waking unrefreshed, cognitive symptoms) are added to the score for the number of symptoms reported to produce a figure for symptom severity.
WPI	Widespread Pain Index: 0–19 measure of diffuse nature of pain used in the ACR-2010 criteria. Nineteen body regions are assessed for presence/absence of pain symptoms.

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Dedicated to the utterly irreplaceable

Dr. Jim McCubbin (1976–2012)

Chapter 1
Introduction

Chronic widespread pain (CWP) is a common condition (estimated to affect 10–11% of the population, Chapter Three) characterised by longstanding diffuse musculoskeletal pain and frequently associated with other physical symptoms such as fatigue, psychological distress and concentration problems. Strictly defined, using the American College of Rheumatology 1990 definition (Wolfe et al. 1990), CWP is the fundamental feature of fibromyalgia (FM). FM and CWP can be considered as points on a spectrum of chronic musculoskeletal pain with FM at the extreme (Häuser et al. 2009c, Wolfe et al. 2013). CWP is associated with poor longterm health outcomes (section 2.2.4) and patients have been found to be frequent consulters in primary care (Kadam et al. 2005). Due to the range of symptoms experienced and recommendations for a multidisciplinary approach to treatment, many feel that CWP should be managed in primary care (section 2.4). Identifying CWP in general practice is therefore important.

No specific morbidity code exists for CWP in UK primary care. It has been suggested therefore that patients who may fulfill the criteria for CWP are often diagnosed and treated in primary care on the basis of the regional pain pattern that they present with (for example, elbow pain or knee pain) (Rohrbeck et al. 2007). Rohrbeck (2002) proposed that patients who could potentially fit established criteria were being coded with multiple regional pain complaints. Using long-term recurrent regional musculoskeletal consultation patterns Rohrbeck (2007) then identified a set of patients in one practice with features consistent with CWP: more health problems, worse self-reported general health, more sleep problems, and higher levels of fatigue. This suggests that there is a group of patients regularly consulting for regional pains (for example, axial pain, hip pain) who are not being recognised, and critically not treated, as having a generalised pain condition.

This research aimed to further develop Rohrbeck's original consultation-based CWP ("recurrent regional consulter") criteria (presented in Table 1.1 and explored in further detail in section 2.) and apply a refined recurrent regional consulter (RRC) definition to explore the epidemiology and changes in self-reported health over time of patients who consult their general practitioner with symptoms suggestive of CWP.

Table 1.1 Rohrbeck RRC definition (2007).

In a period of 5 consecutive years a patient fulfils all of i)–iv): i) At least 1 consultation for a musculoskeletal complaint in the axial skeleton (neck & back); ii) At least 1 consultation for an upper or lower limb complaint; iii) At least 1 consultation for a regional musculoskeletal complaint in each of 3 separate years; iv) At least 4 consultations for regional musculoskeletal complaints in total during the 5 year period.

This chapter provides an overview of the thesis as a whole, an outline of research questions to be addressed, and provides a rationale for the inclusion of each phase of the research to draw the thesis together as a coherent and logically connected piece of work.

1.1 Aims and objectives

The aim of this thesis is to investigate the epidemiology of consultation-based CWP (recurrent regional musculoskeletal consultation) in primary care.

Specifically:

1. To further develop the criteria for consultation-based CWP (recurrent regional musculoskeletal consultation) proposed by Jens Rohrbeck (2007).

2. To assess the quality (efficacy of the search strategy within primary care medical records to return patients with CWP) of the refined criteria by:
   - Comparison of CWP prevalence figures derived using the consultation-based criteria with:
     - Prevalence of CWP in the general population derived from a systematic review;
     - Primary care coding prevalences of generalised musculoskeletal pain conditions related to CWP.
   - Assessing the construct validity of the criteria by examining the features of the patients returned by the criteria and comparing them to those expected in patients with self-reported CWP.
   - Comparison of consultation-based CWP (recurrent regional consultation) status with self-reported CWP status.

3. To investigate the characteristics of patients with consultation-based CWP (termed in this thesis as “recurrent regional consulters”) in terms of: demographics, socio-economic status, comorbidity (including consultation rate, frequent attendance, and numbers of recorded somatic symptoms), and self-reported mental and physical health.

4. To determine changes in pain and general health status over time in recurrent regional consulters.

1.2 Importance of this research

This research further develops the consultation-based CWP (recurrent regional consultation) criteria proposed by Rohrbeck (2007) and employs a refined search strategy to identify patients from routinely recorded primary care data. This allows exploration of the characteristics of patients who consult their primary care practitioner with symptoms suggestive of CWP.

1.2.1 Increased recognition of CWP in primary care

This study further explores the hypothesis that patients fitting the criteria for CWP are being coded by their GPs as having multiple consultations for individual regional pain complaints. There are a number of possible explanations for recording CWP patients as multiple consultations for regional pain complaints. Since no Read code exists for CWP, it may be that clinicians are simply using the code that most closely matches a patient's main presenting problem. However, research (Gallagher et al. 2004, Hughes et al. 2006) suggests that the Read code for FM is under-utilised in primary care, implying that should a code for CWP exist it might not be employed. Given that effective interventions are available (section 2.2.6), whatever the reason for any under-recognition of CWP/FM in primary care, it should be remedied so that patients have access to appropriate interventions and therefore limit poor long-term health outcomes. This research has the scope to provide justification for: i) the provision of a unique code for CWP; and ii) an education programme for primary care practitioners to aid the identification, coding, and management of these patients.

If feasible and financially justifiable, the search strategy to identify recurrent regional consulters could be integrated into general practice software alerting doctors to potential CWP patients. This would allow GPs to implement the appropriate management for the patient, rather than continuing to treat them for a number of individual regional pain complaints.

1.2.2 Epidemiology of CWP

Investigation of the characteristics of consultation-based CWP (recurrent regional consultation) offers delineation of the patient groups affected by CWP with consequent insight into possible risk factors. Specifically, it offers information regarding those that consult their GPs for their symptoms and are perhaps unrecognised as having CWP. Comparison of the sociodemographics of patients who self-report CWP, with patients with consultation-based CWP (recurrent regional consulters), offers information regarding differences between those who consult for their pain and those who do not. This research therefore, is a step towards better recognising and consequently managing these pain syndromes in primary care.

1.2.3 Tool for future research

The finalised recurrent regional consulter criteria could be used to identify cases for future research using medical record data, either as a way to identify potential study participants or as a mechanism for identifying cases in order to evaluate the effectiveness of available interventions.

1.3 Overview of methods and datasets

To satisfy the project's aims and objectives, there are four conceptual stages to the research: 1. Preliminary research; 2. Development of the consultation-based CWP criteria; 3. Validation of the criteria; and 4. Application of the criteria.

The preliminary stage identifies alternative prevalence figures to be used as comparisons for those generated by the criteria. General population figures for CWP and FM are identified via a systematic review of existing literature. Prevalence of recorded non-specific (i.e. with no clear established underlying alternative diagnosis) generalised musculoskeletal pain conditions related to CWP (e.g. fibromyalgia, generalised osteoarthritis) are calculated from routinely coded general practice data to establish a measure of 'recognised' CWP in primary care.

The development and validation stages of the project overlap. The recurrent regional consulter (RRC) criteria are developed and tested using primary care consultation data and linked survey data. First, three lists of regional musculoskeletal Read codes are tested with the criteria (Table 1.1), and then the criteria's consultation patterns (number of regions consulted for and time taken to identify RRCs) are explored.

In the validation stage of the project we test the construct validity of the RRC definition as a measure of CWP (by investigating: age and gender distribution, comorbidity, somatic symptom count, frequent attendance, and self-reported health status), and we investigate the association of RRC status with self-reported CWP status.

Finally, we apply the RRC definition in the final stage of the project to examine the epidemiology of consultation-based CWP and to identify changes in health and pain status over time for RRCs.

The study uses two datasets: The Consultations in Primary Care Archive (CiPCA) and the North Staffordshire Osteoarthritis Project (NorStOP).

1.3.1 CiPCA

Routinely recorded primary care morbidity data stored in CiPCA is used to develop and test the criteria, and explore the epidemiology of RRCs identified using refined criteria. The CiPCA dataset contains anonymised primary care consultation data from 10 to 13 (depending on year) general practices in the North Staffordshire area of the UK. Information stored includes a unique patient identifier, the event date, the Read code and Read term for the complaint or complaints addressed during the consultation, and free text entered by the clinician to document the consultation. The practices involved are part of the Keele GP Research Partnership, consequently routine clinical data recorded by the practices are regularly audited by the informatics team from the Research Institute of Primary Care and Health Sciences at Keele University (Porcheret et al, 2004). Prevalence of musculoskeletal conditions in CiPCA has been demonstrated to be similar to that of larger national primary care consultation databases (Jordan et al. 2007) and international databases (Jordan et al. 2013). Further detail is given in Chapter Four, section 4.3.1.

1.3.2 NorStop

The NorStOP project is a large prospective cohort study of people aged 50 and over. Respondents were recruited from the registered populations of six general practices from the Keele GP Research Partnership which is supported by the North Staffordshire Primary Care Research Consortium. Baseline, three-year and six-year demographic, generic and musculoskeletal postal questionnaire responses have been collected (Thomas et al. 2004a, Thomas et al. 2004b, Thomas et al. 2007, Jordan et al. 2008). These responses have been linked to the medical records of those respondents who consented. Medical record linking allows comparison of self-reported CWP status against consultation-based CWP (recurrent regional consulter) status as one method of validating the criteria. In addition, NorStOP is used to determine changes in pain and general health status of RRCs. Further details of the NorStOP study are given in Chapter Seven, section 7.3.1.

1.4 Thesis synopsis

A synopsis of the content of each chapter is provided below:

Chapter 2

Background

Chapter Two provides a summary of the background literature on CWP including a review of the original research by Rohrbeck (2007) where the consultation-based CWP criteria were initially proposed. The chapter aims to justify the main aims of the thesis, present the challenges faced in achieving them, and present the previous work on which the thesis builds.

Chapter 3

A systematic review and meta-analysis of the prevalence of CWP in the general population

Chapter Three describes a systematic review and meta-analysis of the prevalence of CWP in the general population. One of the main difficulties in developing a strategy to identify a particular group of patients using consultation data is how best to judge the quality of the consultation-based criteria used. One approach to assess how well the RRC criteria perform is to compare prevalence figures for consultation-based CWP (RRC) with population figures derived from a systematic review of existing literature.

The review aims to determine variation in CWP prevalence by age, gender, criteria used to defined CWP, and geographical location. Determining age and gender variation offers a profile of self-reported CWP in the community to compare with consultation-based CWP (RRC).

Chapter 4

Coding prevalence of non-specific generalised musculoskeletal pain in primary care

Chapter Four presents the results of a preliminary study to establish the recorded prevalence of non-specific (i.e. with no clear established underlying alternative diagnosis) generalised musculoskeletal pain conditions related to CWP. This offers a crude measure of 'recognised' CWP coding in primary care, and offers figures for comparison with those for 'unrecognised' CWP determined by the RRC criteria.

Chapter 5

Code list development

Chapter Five presents work to develop and test the list of morbidity codes used by the RRC criteria. The original Rohrbeck recurrent regional consulter (RRC) definition used a list of 147 morbidity codes. This study aims to test and develop the existing RRC definition by defining RRCs using: i) the original short code list (RRC-Rohrbeck); ii) all regional musculoskeletal morbidity codes (RRC-all); and iii) the list of all regional codes excluding any identified by clinicians as unlikely to represent CWP (RRC-clinician). A case-control study is undertaken. RRCs identified using the three lists of morbidity codes are compared with controls. Controls are patients consulting for a musculoskeletal problem in one region only (axial, upper limb or lower limb) during the five-year study period. RRCs and controls are compared on: five-year prevalence, variation in age and sex distribution, number of recorded somatic symptoms, comorbidity, consultation rates, frequent attendance, and recording with recognised alternative diagnoses. To establish a measure of the degree of 'recognised' generalised pain within the three groups of cases, the proportion of RRCs recorded with non-specific generalised pain conditions (e.g. fibromyalgia, generalised osteoarthritis) is also investigated.

Chapter 6

Distribution of painful body regions and relationship to recognised generalised pain in primary care of RRCs

Using the Rohrbeck criteria RRCs can either be recorded with two (axial and, either upper- or lower-limb) or three (axial, upper- and lower-limb) body regions. Chapter Six investigates the distribution of two- and three-region consulters in those patients fulfilling the RRC criteria using the three code lists developed in Chapter Five. Furthermore, two- and three-region RRCs are compared to assess whether patients with consulting for all three sites are more severely affected.

Chapter Six also compares recognised CWP (patients recorded with non-specific generalised pain codes) with unrecognised CWP (RRCs) in primary care, to quantify the degree of overlap between the two and to establish similarities and differences in patient profiles.

Finally, Chapter Six brings together the estimates for community CWP prevalence from the systematic review in Chapter Three, with recorded non-specific generalised pain coding from Chapter Four, and its overlap with RRC prevalence established in Chapter Five. This offers scope for establishing how much recurrent regional consulting might under- or over-estimate CWP.

Chapter 7

Association of recurrent regional consultation with self-reported pain status

Chapter Seven presents work undertaken to explore the association between self-reported widespread pain status and RRC status. In this phase of the project the three groups of RRCs identified by the code lists presented in Chapter Five are further validated in two processes. One approach tests the association of self-reported CWP status with consultation-based CWP (RRC) status. The other approach compares self-reported and consultation-based (number of consultations, number of recorded somatic symptoms, frequent attendance) health measures in RRCs with those in participants self-reporting CWP.

Chapter 8

Time taken to identify recurrent regional consulters

Chapter Eight aims to investigate whether RRCs can be identified over a shorter timeframe than the five-year threshold set by Rohrbeck's original criteria. The first analysis presented in this chapter compares RRCs identified after three years, between three and four years, and between four and five years. This analysis establishes how many patients might be missed by revising the criteria to three or four years, and whether those fulfilling RRC criteria earlier have more severe problems. The second analysis presented in this chapter investigates the effect of removing the requirement for regional consultations in three separate years from the RRC definition. This establishes how much sooner RRCs can be identified, and the number of extra patients picked-up by removing the requirement for consultations in three separate years. The extra RRCs identified by removing the separate years requirement are compared with established RRCs to determine whether the extra patients identified still fit the RRC profile.

Chapter 9

Characteristics of recurrent regional consulters and changes in health over time

Chapter Nine describes the demographic and socioeconomic characteristics of RRCs identified using the final criteria, and changes in their self-reported general health and pain over time.

Chapter 10

Discussion

The final chapter draws together all the strands of thesis to present a summary of the findings, a discussion of the work as a whole, its conclusions, recommendations for future research, and a critical reflection of its strengths and limitations.

Chapter 2
Background

2.1 Introduction

This chapter aims to present a synopsis of the background literature to: i) justify the central objective of this thesis, which is to develop a means of identifying chronic widespread pain (CWP) patients in general practice using their routinely recorded primary care data; ii) present the challenges faced in achieving this; and iii) present the previous work that this thesis builds upon.

First, we will construct an argument for the importance of identifying CWP in primary care. We will define CWP, outline its historical context, controversy about its existence and diagnosis, and discuss its natural history and management, to advocate that CWP is a valid diagnosis and that, if patients can be identified, then effective interventions are available. Moreover, this chapter will show where a new primary care consultation based definition of CWP (developed in this thesis) will fit in with existing case phenotypes.

We will then discuss morbidity coding in primary care to understand the challenges of identifying a controversial diagnosis using routinely recorded data. We will describe Read codes, the system used to record primary care morbidity data in the UK, and we will discuss how specific phenotypes may be identified from the data.

Finally, we will present the criteria originally developed by Jens Rohrbeck (2002) to identify CWP using primary care data (consultation-based definition of CWP). We will discuss the limitations of the criteria in order to present the case for developing them further.

2.2 Chronic widespread pain

Chronic widespread pain (CWP) is the fundamental symptom of fibromyalgia (FM). Both present with longstanding multisite pain that may be associated with additional physical symptoms such as fatigue, psychological distress, and concentration problems. CWP and FM have been described under the umbrella heading of functional somatic syndromes. The term functional somatic syndrome has been used to describe conditions with physical symptoms that have no currently accepted biomedical explanation (Nimnuan et al. 2001a). There are a number of physical symptoms (such as fatigue, psychological distress and concentration problems) that have been observed to appear across the different manifestations of functional somatic syndromes (Aggarwal et al. 2006) leading some to suggest a common underlying condition with varied presentations (Nimnuan et al. 2001a).

There has been no extensive review of the reported prevalence of CWP, but it has been estimated to affect 10–11% of the general adult population and is seen more frequently in women (Davidson 2010). It has been defined in a number of ways. A common definition of CWP uses the 1990 American College of Rheumatology (ACR-90) criteria for FM and defines CWP as pain, lasting three months or longer, located axially (cervical spine, thoracic spine, anterior chest or low back), above and below the waist, and on the left and right sides of the body (Wolfe et al.1990). Using the 1990 ACR criteria, FM diagnosis requires CWP in addition to a minimum of 11 tender-points from a possible 18 anatomical sites.

In 2010, the American College of Rheumatology published an alternative set of criteria (ACR-2010) (Wolfe et al. 2010), meant to be used clinically, which emphasised the importance of the somatic symptoms (e.g. fatigue, waking unrefreshed, cognitive symptoms) which have been associated with FM. The ACR-2010 criteria dispensed with tender point examination and instead used a measure of the widespread-ness of pain, and a measure of the number of somatic symptoms experienced such as fatigue and cognitive impairment. The new criteria place FM at one extreme on a spectrum of polysymptomatic distress.

It is considered by many that the relationship between FM and CWP is one of gradation rather than of categorical distinction (Macfarlane 1999b, section 2.2.2), so much of what can be said of FM will also be true for CWP. Therefore, due to the intimate relationship of the two conditions,

some of the following section presents research and debate around the FM concept rather than CWP specifically.

2.2.1 Historical context

Accounts of widespread musculoskeletal pain associated with fatigue and psychological disturbances have a long history in medical literature (Reynolds 1983, Inanici and Yunus 2004). However, it was not until the second half of the twentieth century that what we might recognise as modern fibromyalgia began to be discussed under the name 'fibrositis' (Traut 1968, Smythe 1972), a term first used by William Gower in 1904 to refer to regional musculoskeletal symptoms, or 'muscular rheumatism.' Fibrositis was used as a catch-all diagnosis for pain of almost any origin until the 1950s (Reynolds 1983, Block 1999, Wolfe and Wallit 2013). Then, between the fifties and early seventies, first Graham, then Traut and Smythe (Inanici and Yunus 2004) applied the term to a syndrome of musculoskeletal pain and tender points, but it was not until 1976 that the term fibromyalgia was first used (Hench 1976).

In fibrositis and fibromyalgia, the late twentieth century researchers had unwittingly revived a condition described by the neurologist George Beard in the 1880s as neurasthenia (Beard 1894, Wessely 1990). In his treatise on nervous exhaustion, neurasthenia was presented as condition of fatigue and multiple physical symptoms (including musculoskeletal pain), which he attributed to the daily stress of life.

Over the years, the relative weight attributed to tender points versus somatic symptoms has oscillated between case definitions. In the modern literature, Smythe was the first to use tender points as a diagnostic standard. In 1972 he described fibrositis as generalised pain, fatigue, poor sleep, morning stiffness, emotional distress, and multiple tender points. The tender point sites were further clarified in Smythe and Moldofsky's 1977 publication, where the definition required a tender point count of 12 out of 14 sites.

The first research based definition of FM was published in 1981 by Yunus and colleagues, who had undertaken a case-control study of 50 FM patients and 50 matched controls with no history of musculoskeletal conditions. The Yunus et al. criteria, in contrast to Smythe's focus on tender point count, put more weight on symptom history than on tender points.

The publication of the 1990 American College of Rheumatology (ACR-90) definition (Wolfe et al. 1990) heralded a new era for FM. Developed by a multicentre study and with the backing of a respected scientific body, this new definition acquired a credibility, which allowed it to become the 'official' case definition for FM (Wolfe and Walitt 2013). A more uniformly accepted approach to FM diagnosis provided a common language and a framework for researchers to share observations and develop theories for understanding FM and CWP. The ACR-90 FM criteria relied on widespread pain and a tender point count, dispensing with any need for a symptom history.

2.2.2 Currently used case definitions

The most frequently used definition of CWP is the ACR-90 definition. However, the ACR-90 definition has been criticised for being too inclusive and not accurately reflecting truly widespread pain. This prompted Macfarlane and colleagues to offer a refinement of the criteria in 1996 (Macfarlane et al. 1996a). This more strict case definition has been termed the Manchester criteria. The Manchester criteria define chronicity as persistent or recurrent pain for more than three months of the last year. Like the ACR-90 criteria, pain must be present in at least two contralateral body quadrants however, to reflect a more diffuse pattern of pain, for a body quadrant to be deemed positive, pain must be present in at least two regions of that quadrant. Hunt et al. (1999) suggest that while the ACR-90 criteria are useful in a clinical setting, the Manchester definition offers greater comparability between epidemiological studies, since the more stringent criteria define a more distinct syndrome. Patients satisfying the Manchester criteria are more likely than those satisfying the ACR-90 criteria alone to complain of additional symptoms such as psychological disturbance, fatigue, sleep problems and to have tender points (Macfarlane et al. 1996a). Those satisfying the ACR-90 criteria alone were argued to be more similar to patients with regional pain complaints. This suggests that the Manchester criteria are identifying patients more likely to fit the construct of CWP however, there has been little uptake of the criteria by the research community. Nevertheless, the importance of the symptoms seen more frequently in those satisfying the Manchester criteria has been recognised by their incorporation into the new 2010 ACR FM criteria (Wolfe et al. 2010).

Despite their popularity, and while high tender point counts have been associated with distress (Croft et al. 1994, McBeth et al. 1999), there have been a number of other criticisms of the ACR-90

criteria. Some have suggested that there were difficulties with conducting the tender point count, that some clinicians did not use tender points to diagnose FM (Wolfe 2003, Katz et al. 2006) and that the pre-eminence of the tender point count ignored other physical symptoms associated with FM (Crofford and Clauw 2002, Wolfe 2003). The threshold 11 out of 18 tender points was also described as an arbitrarily defined cut-off (Croft et al. 1996, Fitzcharles 1999) that failed to recognise a spectrum of pain and distress (Schochat et al. 1994); indeed, 'by placing diagnosis at the end of the severity spectrum we lost the appreciation of the spectrum itself' (Wolfe 2003, p. 1671).

In 2010 therefore, a new set of case criteria were published (ACR-2010, Wolfe et al.). The ACR-2010 criteria removed the need for tender point examination, included somatic symptoms, and offered a scale to measure polysymptomatic distress. In removing the need for tender point examination, the new criteria are arguably more practical in primary care. The new criteria use a 'widespread pain index' which assesses the presence of pain in 19 body regions, resulting in a score between zero and 19. A measure is also made of symptom severity. Fatigue, waking unrefreshed, and cognitive symptoms are specifically assessed and each assigned a score between zero (no problem) and three (severe problem). The number of somatic symptoms reported is also scored from zero (no symptoms) to three (a great deal of symptoms). The scores for the three individual symptoms (fatigue, waking unrefreshed, cognitive symptoms) are added to the score for the number of symptoms reported to produce a figure for symptom severity between zero and 12. For a diagnosis of FM, symptoms should have been present for at least three months with no alternative explanation for the pain and either: i) a widespread pain index of seven or over, and symptom severity of five or more; or ii) a widespread index of between three and six, and symptom severity of nine or more.

The scoring used in the ACR-2010 definition suggests that FM is part of a spectrum of medically unexplained pain disorders rather than a discrete, isolated condition. To investigate this, Wolfe and colleagues (2013) summed the 0–19 widespread pain index score with the 0–12 symptom severity score to produce a 0–31 polysymptomatic distress score that they used to test the association of polysymptomatic distress with various self-reported health and social outcomes. Results supported the hypothesis, demonstrated by other studies (Häuser et al. 2009c, Croft et al.

1996), that fibromyalgia is a continuum disorder. Seen in this light CWP is a less severe manifestation on the same spectrum.

2.2.3 Recognition and acceptance

a. Controversial diagnosis

With the predominant model applied in medical practice being biomedical (Wade and Halligan 2004) it is perhaps no surprise that a condition with no pathognomonic markers has been a controversial one. The biomedical model of disease focuses on physical (somatic) causes of illness and offers no role for psychological or social influences on health. It sees illness as having an underlying cause that, once removed, will result in a return to health. In this paradigm a syndrome with no objective biomedical markers, such as FM/CWP, simply does not exist. However, research has shown that doctors try to rely on a biomedical view when dealing with patients experiencing FM (Hellström et al. 1998), choosing to focus on symptoms that are manageable within a biomedical context.

The biomedical model is often contrasted with the biopsychosocial model championed by George Engel (1977). The biopsychosocial model recognises psychological and social influences on health and dissolves the mind-body split. Following a qualitative study of doctors' attitudes to fibromyalgia, Hellström and colleagues (1998) recommended applying a patient-centred (biopsychosocial) model to managing interactions with FM patients. They suggest that patients would benefit from help to manage difficult life-situations rather than efforts to understand their symptoms using a biomedical framework.

Many though, have questioned the validity of a painful condition in the absence of measurable clinical abnormality (Ehrlich 2003a, Gordon 2003). In 2009, in what Wolfe (2009a) called the 'fibromyalgia wars', the pages of the Journal of Rheumatology saw a spirited debate on the topic. Sarkozi (2009) described FM as 'the fallacy of the pain from nowhere,' arguing that spontaneous central sensitisation cannot appear without a stimulus. Others countered with examples of widely accepted conditions with a similar pattern, including phantom limb syndrome and post herpetic neuralgia (Shir and Fitzcharles 2009b), and offered evidence from published research of disturbed biomedical markers in FM, including abnormalities in functional magnetic resonance imaging, increased substance P in the cerebrospinal fluid, and abnormalities of the hypothalamic

pituitary axis (Harth and Nielsson 2009). Meanwhile, others questioned whether a debate about the biomedical validity of a disease is relevant, suggesting that, using a biopsychosocial approach, illness exists if there is suffering (Wade and Halligan 2004), and few can question that there is suffering in chronic pain.

In an essay on what he termed 'the medicalization of misery,' Hadler (2003) argued that musculoskeletal pain is a normal experience of the human condition, going on to suggest that individuals choose to be patients because their ability to cope with this normal pain is challenged by 'the psychosocial context in which the pain is suffered' (Hadler 2003, p.1668). This theory is supported by the observation of increased rates of CWP and FM in war veterans (The Iowa Persian Gulf Study Group 1997, Barrett et al. 2002), survivors of a major train crash (Buskila et al. 2009), and following childhood trauma (Häuser et al. 2011, Jones et al. 2009).

If the patient in distress is offered the fibromyalgia label by the physician then Hadler suggests that the patient 'learns to be a patient with fibromyalgia' (Hadler 2003, p.1669). In this context, fibromyalgia may be termed a socially constructed illness; a collusion between doctor, patient, academic, and the pharmaceutical industry (Hadler and Greenhalgh 2005, Wolfe 2009a). The patient is offered legitimisation, which may lead to social gain, or even medical insurance compensation (Thorson 1999, Wolfe 2009a). The doctor, rather than feeling unable to help, can offer diagnosis and treatment (Fitzcharles 1999). The academic has a topic to research and treatments to develop, and the pharmaceutical industry a market to sell to (Wolfe 2009a). The concept of FM as disease is maintained by the interested parties. However, evidence suggests that few physicians recognise FM as a valid diagnosis (Blotman et al. 2005, Kumar and Pullar 2003, Arshad and Ooi 2007, Kamoun et al. 2010), and some contend that, 'the pharmaceutical industry was, until quite recently, conspicuous by its absence' in fibromyalgia research (Harth and Nielson 2009, p.2837).

Similar arguments of social construction have been levelled at psychiatric illnesses (Eisenberg 1988). Indeed in labelling FM a social construct, Hadler and Greenhalgh (2005) were seeking to place it in a social context and caution against the dangers of labelling. It was Hadler's (2003) hope that if a patient accepted the contribution of their mind to their symptoms, they might be afforded some comfort, rather than what he saw as a counterproductive medicalisation of their

symptoms. However, White (in Wessely and White 2004) cautions against telling a patient they have a psychosomatic disorder, arguing that it is detrimental to the doctor-patient relationship, and suggesting that to most patients, 'psychosomatic means malingering' or 'all in the mind.' (Wessely and White 2004, p.96).

Ehrlich (2003a) argued that labelling a patient with FM becomes counterproductive to coping since the social context of the label perpetuates the condition, Quintner and Cohen stated that it is 'a label so easily abused as to have become meaningless' (1999, p.1092), and Wolfe (2009a) has asserted that the FM label contributes to medicalisation and creates an overall societal burden, causing problems including: increasing disability, corrupting scientific research, and increasing medical costs and treatments. Contrary to this, research suggests that the FM label does not have an adverse long-term effect (White et al. 2002a) and two UK-based studies (Annemans et al. 2008, Hughes et al. 2006) have found that GP visits, investigations and prescriptions decreased initially after diagnosis however, consultations increased again two to three years post-diagnosis.

There has been much criticism of the ACR-90 criteria due to the circular logic used to arrive at the definition (Cohen 1999, Quintner and Cohen 1999). The criteria were developed by ranking symptoms and then applying the diagnostic label to reiterations of the same presenting symptoms (Hadler 2003). They were judged to offer no insight into possible pathological mechanisms and to have been validated by 'a circular argument in which the evidence on which the construct is based is taken as proof of its veracity' (Cohen and Quintner 1993, p.906). Goldenberg (1995) challenges that expert opinion will form the gold standard for any illness without objective clinical findings. Psychiatric diseases are defined by 'validated diagnostic classifications based solely on symptoms' (Goldenberg 2004, p.634) and until we find a reliable biomarker, a clear case definition provides a useful framework and a common language for research.

Most medical specialities have a defined condition for which there has been no clear explanation, for example: rheumatology has fibromyalgia, gastroenterology – irritable bowel syndrome, neurology – tension headaches, dentistry – temperomandibular joint syndrome, and general medicine – chronic fatigue syndrome (Escobar et al. 2002). They have been known under a variety of umbrella labels including: medically unexplained syndromes, functional somatic syndromes, and psychosomatic or somatoform disorders. Most are seen more commonly in

women, they often respond to similar interventions (Wessely et al. 1999), often share common symptoms such as fatigue, cognitive impairment and psychological distress, and individuals with one are at increased risk of developing another (Aaron et al. 2000, Aggarwal et al. 2006). This has led some to question a common underlying pathology giving rise to varied clinical presentations (Wessely et al. 1999, Aaron et al. 2000). However, others have argued against the uniting of functional somatic syndromes into a common condition, asserting that study of the individual discrete disorders offers greater insight into aetiology, the development of better treatments, and more accurate predictions of prognosis (White in Wessely and White 2004).

However, Peter White (2010) suggests that the truth may be more complex and maintains that future investigation will be enhanced by studying both the similarities *and* the differences between syndromes. The road to our future understanding will therefore come from recognising and researching both the commonalities and heterogeneities between these conditions. This idea is supported by a recent study (Lacourt et al. 2013) using cluster analysis to define groups within a sample of 394 individuals with functional somatic syndromes. Evidence was found to support both an overall common condition differentiated by symptom severity, and multiple specific syndromes differentiated by symptom specific patterns.

The categorical nature of the FM case definition has provoked debate. Some argue that the ACR-90 definition wrongly implies a binary state of presence or absence (Wolfe 2009a). The ACR-90 definition has a discrete cut-off point that determines who has FM and who does not. It is argued that this dichotomy fails to represent the continuum of polysymptomatic distress felt to be part of FM (Wolfe 2003). This theory ties in with the argument of FM as one manifestation of a common functional somatic syndrome, since a categorical case definition based only on widespread pain does not place FM in context with other functional somatic syndromes. Wolfe states that by limiting diagnosis to the extreme we overlook the spectrum, ‘the range of human distress that exists across all illness and persons, not just in those with 11 tender points’ (Wolfe 2003, p.1671). This argument, as well as a perceived problem with conducting tender point counts, was part of the rationale for developing the ACR-2010 FM criteria (Wolfe 2010). By using a combination of symptom severity and a quantitative measure of widespread pain the ACR-2010 criteria were intended to offer a FM symptom scale (Wolfe et al. 2011a), rather than simply a binary classification.

There may be controversy regarding the biomedical basis of fibromyalgia, the influence of society on its symptoms, the effect of the FM label, the tautology of the ACR-90 definition, and whether FM should be considered a discrete clinical entity. However, much of the preceding debate seems to conclude that regardless of disagreement, there is a group of people experiencing distress, and whether or not current labels and classifications are appropriate, they serve as a useful starting point for continued research and debate.

b. Awareness and accuracy of diagnosis

Doctors have reported inadequate formal training in FM (Buskila et al. 1997b, Kamoun et al. 2010, Arshad and Ooi 2007). In an international survey (Perrot et al. 2012) of 1,622 doctors, 53% admitted to difficulty in diagnosing FM, 54% reported inadequate FM training, and awareness of the ACR criteria ranged from 32% for psychiatrists to 83% in rheumatologists.

Surveys investigating awareness of diagnostic criteria have found generally poor levels of knowledge. In France (Blotman et al. 2005) 46% of GPs surveyed did not know the ACR-90 criteria and 17% did not believe widespread pain to be a characteristic feature. In a comparable study in Israel (Buskila et al. 1997b), only 55% of GPs knew that FM was associated with widespread pain and only a quarter were familiar with the tender point count, while in Tunisia (Kamoun et al. 2010) only 14% were familiar with the ACR-90 criteria.

Blotman et al.'s (2005) French survey of clinicians found that while the majority (96–98%) believed in the existence of FM, only 23% of rheumatologists and 33% of GPs considered it to be a disease. Similarly, in both Scotland (Kumar and Pullar 2003) and Southeast Asia (Arshad and Ooi 2007) the majority of rheumatologists believe FM to be a distinct clinical entity but not a pathological disease. However, in Tunisia, (Kamoun et al. 2010) only 17% of GPs recognised FM as a clinical entity.

Given the controversy surrounding the FM diagnosis, a reported lack of formal training, the limited awareness of diagnostic criteria, and the variety of perceptions regarding the status of FM as a distinct clinical or pathological entity, it should come as no surprise that the diagnostic accuracy of primary care physicians has been low. One study in Canada (Fitzcharles and Boulos 2003) found only 34% of patients referred to a rheumatologist with a FM diagnosis were correctly diagnosed and another study found only 12% (Gamez-Nava et al. 1998). In contrast, a more

recent study in Israel (Shleyfer et al. 2009) found agreement between GPs and rheumatologists in 71% of FM cases.

c. Attitudes

While their reasons might be uncertain, physicians are uncomfortable with medically unexplained syndromes. Most GPs find patients with medically unexplained symptoms challenging to manage (Reid et al. 2001a). Doctors have referred to these patients as 'difficult' or 'heartsink,' and report problems in conducting consultations with them (Ring et al. 2005). Hellström et al. (1998) found that doctors struggled with clinical uncertainty and the desire to apply a biomedical paradigm to FM, and prioritised a technical diagnostic approach to avoid the risk of missing important alternative diagnoses. The primacy of diagnosis was also noted by Ring and colleagues (2004), who found that patients with medically unexplained syndromes received disproportionate levels of physical intervention, proposed more often by their GPs than by themselves. There has been concern that the therapeutic relationship may be damaged by suggesting to a patient that their symptoms have a psychological component (White in Wessely and White 2004). However patients with medically unexplained symptoms have been shown to offer cues concerning psychological difficulties that are not picked-up by their physicians (Salmon et al. 2004). It is possible therefore that it is the doctors, not their patients, who are uncomfortable with moving away from the biomedical paradigm.

2.2.4 Natural history and long-term health outcomes

Research suggests that musculoskeletal pain exists on a continuum from single- to multisite pain (Kamaleri et al. 2008a, 2008b). Multisite chronic pain has been found to be more common than single-site chronic pain (Carnes et al. 2007) and evidence suggests that progression from local to widespread pain is common (Forseth et al. 1999, Kamaleri et al. 2009, Kindler et al. 2010). Increasing numbers of pain sites have been observed to be related to reduction in overall health, poor sleep quality, psychological distress (Kamaleri et al. 2008b), and numbers of reported somatic symptoms (Coggon et al. 2013). This suggests that CWP and FM exist at the opposite end of a spectrum from single-site pain with no additional symptoms.

Evidence suggests that FM and CWP often show a persistent and recurrent pattern. Between a third and half of CWP patients reported persistent CWP at follow-up intervals of between one and

seven years, and only 11–16% had no pain at follow-up (the remaining patients complain of regional pains at follow-up) (Macfarlane et al. 1996b, McBeth et al. 2001a, Bergman et al. 2002, Papageorgiou et al. 2002). Risk factors identified for persistent CWP have included increasing age (Macfarlane et al. 1996b, Bergman et al. 2002, Papageorgiou et al. 2002), increased number of painful regions or high tender point count (Macfarlane et al. 1996b, Bergman et al. 2002), psychological distress and fatigue (Macfarlane et al. 1996b, McBeth et al. 2001a), additional physical symptoms (Macfarlane et al. 1996b, Papageorgiou et al. 2002), family history of chronic pain (Bergman et al. 2002), and illness behaviour characterised by frequent attendance to primary care (McBeth et al. 2001a).

Consistent with the spectrum theory of CWP/FM, outlook in FM is worse than in CWP. White and Harth (2001) reviewed six follow-up studies of FM and concluded that complete remissions of FM are rare. In a recent study (Walitt et al. 2011), 1,555 FM patients under the care of a speciality clinic were followed-up biannually for up to 11 years. Overall 10% of patients reported a substantial improvement and 15% a moderate improvement in pain however, pain worsened in 39% of patients. Over the duration of the study period patients fluctuated between positive and negative on the ACR-2010 criteria. There was a general trend for continued high levels of self-reported symptoms and distress for most patients with only slight improvement over time. This is consistent with a six-centre study (Wolfe et al. 1997) following up FM patients at seven years. Severity of pain, functional disability, sleep disturbance and psychological status varied little over time.

Overall prognosis and outcome in FM and CWP are poor. In addition CWP has been associated with long-term increased mortality, particularly as a result of cancer (Macfarlane et al. 2001, McBeth et al. 2009), although other studies have not found such an association (Andersson 2009, Macfarlane et al. 2007).

2.2.5 Consultation behaviour

Seventy-two percent of individuals with ACR-90 defined CWP reported having consulted their GP for their pain (Macfarlane et al. 1999). CWP patients have been found to consult more frequently than patients with no pain, independent of their level of psychological distress (Kadam et al. 2005), suggesting that frequent attendance is a feature of CWP. Indeed research has demonstrated an association between CWP and help-seeking behaviour for health problems (Gupta et al. 2007).

Frequent attenders are more likely to have musculoskeletal problems than controls (Jyväsjärvi et al. 1998, Karlsson et al. 1994) and research demonstrates that 20–30% of frequent attenders have medically unexplained symptoms (Smits et al. 2009, Reid et al. 2001a) or are considered to be somatisers (Karlsson et al. 1997, Jyväsjärvi et al. 2001). It is estimated that 80% of clinical work is taken up by 20% of patients (Smits 2009), therefore, identifying and managing patients with CWP appropriately in primary care has the potential to reduce workload.

2.2.6 Management

An extensive systematic review commissioned by EULAR (European League Against Rheumatism) (Carville et al. 2008) looked at 146 studies that investigated management approaches to FM. A multidisciplinary approach, using an individualised combination of pharmacological and non-pharmacological therapies was recommended. Recommended pharmacological interventions included tramadol, paracetamol, weak opioids, antidepressants, tropistetron, pramipexole, and pregabalin. Recommended non-pharmacological therapies included individually tailored exercise programmes, cognitive behavioural therapy, and heated pool treatment. The review also highlighted the importance of a comprehensive assessment of pain, function, and psychosocial context in the diagnosis and management of FM. Given the recommendation of a multidisciplinary tailored approach to management, Glennon (2010) argues that GPs are in a strong position to diagnose and select which therapies are best suited to individual patients. This highlights the importance of recognising FM and CWP in primary care.

Research suggests that new-onset CWP is increased in individuals with multiple physical symptoms, sleep problems, adverse life events, help-seeking behaviour for health problems, (Gupta et al. 2007), and other features of somatisation (McBeth et al. 2001b). Further, persistent

CWP was also associated with psychological distress, fatigue, and other features of somatisation (McBeth et al. 2001a). This suggests that modification of these risk factors may be a useful target for intervention. Indeed, a recent trial (McBeth et al. 2012) showed telephone delivered cognitive behavioral therapy to offer significant improvements in outcomes (compared to those treated with graded exercise, combined intervention, or treatment as usual) for CWP patients. This implies that if we were able to identify patients at risk of CWP we might be able to reduce progression of symptoms towards the extreme end of the spectrum of polysymptomatic distress.

2.3 Morbidity Coding

In the UK in order to be able to retrieve meaningful information from the primary care electronic medical record, each patient encounter is summarised using codes that correspond to a standard set of clinical terminology. This allows electronic medical records to be used for tasks such as: clinical decision support, audit, research, and governance (Benson 2002). The majority of UK primary care electronic medical record systems use the Read clinical classification or 'Read codes' (Simpson et al. 2007, Benson 2002). The codes are alphanumeric strings up to five characters long. Each code is a unique identifier to a preferred clinical concept that can also be labelled with additional synonymous terms.

Read codes are organised into chapters, reflected by the first character of the code. The numerical chapters (0–9) represent history and examination findings, clinical procedures (investigations or therapeutic procedures) and administrative codes. The chapters denoted by letters represent diagnostic classifications, for example, Chapter A contains codes for infectious diseases and Chapter N for musculoskeletal and connective tissue diseases. Each additional character adds more detail, allowing increasing granularity down to five hierarchical levels, so each 'child' code represents a more detailed diagnosis than its parent code. For example, chapter heading G represents circulatory disorders, its 'child' code G3 represents ischaemic heart disease, G30 acute myocardial infarction, and G300 acute anterolateral infarction.

Studies using routinely recorded medical record data rely on the quality of morbidity coding. Quality varies and is subject to the influence of a number of barriers to accurate coding.

2.3.1 Quality of morbidity coding

There are limitations to the coding structure used in UK primary care. In a systematic review of studies investigating the quality of primary care medical record data, Thiru and colleagues (2003) found the ability of variables recorded (in GP records) to identify specific diagnoses or lifestyle factors varied; with sensitivity of recorded variables ranging from 37% for accurate alcohol history to 100% for prescribing data. In another systematic review Jordan et al. (2004) again concluded that the quality of morbidity coding was variable, noting a higher quality of recording for

conditions with clear diagnostic features (e.g. diabetes) than for conditions with more subjective criteria (e.g. asthma)

The nature of morbidity coding may change over time. Following the introduction of the new General Medical Services contract in 2004, substantial financial rewards were linked to a number of quality indicators (Doran et al. 2006, Sutton & McLean 2006). The contract increased practice income based on performance in areas of 'quality' identified in the Quality and Outcomes Framework (QOF). The QOF identified 146 clinical and organisational benchmarks (Doran et al. 2008, Guthrie et al. 2006). Quality points were accrued by evaluation of a limited list of Read codes from practice records (Williams and de Lusignan 2006). As the financial welfare of a practice became intimately linked to it, there was new emphasis on coding. While the QOF may have led to improvements in data quality in the domains it assesses, these improvements may not have occurred in other clinical domains (Bayley 2005). Musculoskeletal morbidity was not included in the QOF, so at best, it can only have an indirect effect on the reliability of coding for these problems.

Of specific note to this thesis, a recent study (Salisbury et al. 2013), analysing video-recorded primary care consultations, found that only 32% of musculoskeletal complaints were Read-coded, while 85% were recorded in free-text notes. Problems in primary care frequently do not conform to the biomedical framework that coding classifications model. Clinicians interviewed by de Lusignan et al. in 2003 felt that applying a label to an unclear diagnosis had the potential to stigmatise and failed to leave room for emergent diagnoses. It is also unreasonable to imagine that any coding scheme could provide appropriate codes to cover every facet of the complex human condition. New conditions may not yet have assigned codes; existing codes may not provide the necessary level of detail.

Peat et al. (2005) suggest that coding may be a reflection of individual GPs' diagnostic beliefs and the patterns and context of their coding behaviour. Pearson et al. (1996) also hold this view, arguing that inter-practice variation in coding observed in their study was likely to be due to general practitioners' different diagnostic approaches. In instances of clinical uncertainty, the diagnostic practices of an individual clinician are likely to play a role in the codes they assign to the patient's problem.

In the UK every time we interact with the health service we generate electronic data. Over 95% of the UK population are registered with a GP (Bowling 1997) and in 2008 only 10% of the UK population had private health insurance (Hawe et al. 2011, p.69). Consequently, routinely recorded NHS data can be considered a fair approximation of the conditions for which the general population presents to health care. Our electronic medical records therefore represent a rich and pragmatic (since data are collected as part of everyday clinical practice) source of data for research. However they must be used with an appreciation of the complexity of the environment in which the data are created and entered, recognising that the accuracy of coding will vary between patients, clinicians and practices. Specifically, in the context of this thesis, we must recognise that evidence suggests many musculoskeletal complaints are not coded (Salisbury et al. 2013), and coding of conditions with subjective case definitions is variable (Jordan et al. 2004).

2.3.2 Using routinely recorded data to identify cases

Previous studies have used combinations of Read-codes to identify specific conditions in primary care (Gray et al. 2003, Anandarajah et al. 2005, Linsell et al. 2006, Herrett et al. 2013). However, while primary care records are indeed 'goldmines for research' (de Lusignan et al. 2006), using Read-coded data for epidemiological research is not without problems. Like more traditional health research, we need to decide exactly who it is we are interested in studying and what exactly is the clinical phenotype we are interested in. Using either established disease definitions (from existing literature) or expert consensus, we need to clearly define the outcome we are interested in. Then we need to decide who has that outcome based on what is recorded in their medical records; what combination of information available will represent that phenotype (Faulconer and de Lusignan 2004). Sometimes morbidity codes available in the data will restrict the individuals we can identify as either there is no specific code (as is the case for CWP) or the coding scheme does not offer the level of granularity required. Finally, we need to check whether the people our search strategy identifies actually have the phenotype we said we were trying to find.

Deciding on code lists that will identify a particular phenotype is not easy and can involve laboriously going through long code lists to ensure important codes have not been missed. A

2003 study (Gray et al.) of Read codes used in diabetes management illustrates that, even for a well-defined disease like diabetes, there is a wide range of codes in use. Twenty-five individual diabetes codes were in use across 17 general practices, with only one code in use in all 17 practices. There are likely to be differences in coding and diagnostic practices, so different codes are likely used by different clinicians to record the same clinical scenario (Hobbs and Hawker 1995). Some studies have made use of consultation patterns for specific codes, rather than individual codes, to improve confidence in case identification (Rohrbeck et al. 2007, Marschall et al. 2011).

Fortunately there are ways we can check whether the people our search strategy finds match the phenotype we were aiming for (Faulconer and de Lusignan 2004). We can examine whether: i) incidence or prevalence figures match what the literature predicts; ii) the patients we find have profiles similar to those of the clinical phenotype we are intending to find (for example, do they have a similar age and gender distribution, and do they have a similar risk profile?). In addition, we can check with a relevant standard to see if the patients we are finding match, by: i) reviewing a sample of case notes; ii) cross checking with relevant linked disease registries if available (Herrett et al. 2013); or, iii) if appropriate, using self-reported data or making a clinical assessment.

When interpreting the results of medical record studies we must therefore be aware of: i) the challenges involved in phenotyping the symptom, condition, or syndrome of interest; ii) matching that phenotype to the data available; iii) the accuracy of the data; iv) whether or not our search strategy (the combination of codes or consultation pattern) identifies the phenotype we set out to find; and v) how many of the cases we hope to find will have consulted for their problems. Clearly there are implications here for our intention to identify a relatively ill-defined and controversial condition like CWP using Read-coded data.

2.4 Identifying CWP in primary care

Due to the range of symptoms experienced and a multidisciplinary approach to treatment, many authors have argued that FM and CWP should be managed in primary care (Endresen 2007, Shir and Fitzcharles 2009a, Glennon 2010, Ghazan-Shahi et al. 2012). In a survey of 150 Canadian rheumatologists 89% felt that GPs should be the main care provider in FM and 71% did not want to retain ownership of FM (Ghana-Shahi et al. 2012). A survey of 284 UK GPs (Reid et al. 2001a) concluded that, although patients with medically unexplained symptoms are difficult to manage, the majority feel they should be managed in primary care. Further, CWP is common (10–11% of the population), causes suffering and can be treated (section 2.2), and CWP patients have been found to be frequent consulters (Kadam et al. 2005). Identifying CWP in primary care is therefore important. However, awareness, acceptance and recognition of FM/CWP by GPs varies (section 2.2.3).

There is no Read code listed for CWP, but a code does exist for FM. However, the disparity between the community prevalence for FM and the number of reported cases of FM in UK primary care suggests that the diagnostic label of FM is not often used in general practice (Gallagher et al. 2004, Hughes et al. 2006). One explanation might be the controversial nature of FM (see section 2.2.3), and another that some GPs are cautious about the wider implications of diagnostic labelling (Bedson et al. 2004).

The underuse of the FM code may be justified by insufficient time in a routine primary care consultation to undertake a full tender point examination. However, with the introduction of the new ACR-2010 criteria, the diagnosis of FM is more accessible in this setting (Glennon, 2010). Perhaps as the new criteria become more widely recognised and implemented in primary care, the coding prevalence of FM in primary care will increase. Whatever the reason for the observed disparity, we are left with the question of how consultations with these patients are being coded. It has been suggested that patients who may fulfil the criteria for CWP are often diagnosed, recorded and treated in primary care on the basis of the individual regional pain pattern that they present with (e.g. shoulder or knee pain), rather than on the basis of an arguably more appropriate generalised pain condition (Rohrbeck et al. 2007). Rohrbeck et al. suggested that

patients who could potentially fit established criteria were being coded as multiple regional pain complaints.

2.4.1 Existing criteria

Jens Rohrbeck, a GP Research Fellow at Keele University, and colleagues set out to map the ACR-90 criteria for CWP to primary care consultation patterns for regional musculoskeletal pain complaints (2002, 2007). He developed a search strategy to identify patients with CWP using consultation patterns for a selected number of Read codes for musculoskeletal pain complaints (Table 2.1).

Table 2.1 Rohrbeck RRC definition (2007).

In a period of 5 consecutive years a patient fulfils all of i)–iv): i) At least 1 consultation for a musculoskeletal complaint in the axial skeleton (neck & back); ii) At least 1 consultation for an upper or lower limb complaint; iii) At least 1 consultation for a regional musculoskeletal complaint in each of 3 separate years; iv) At least 4 consultations for regional musculoskeletal complaints in total during the 5 year period.

Rohrbeck's criteria can be thought of as having three dimensions:

1. *Read codes*: A list of regional musculoskeletal problem codes that potentially represent CWP.
2. *Numeric limits*: The number of episodes of pain consulted for over the specified timeframes. These figures attempt to capture both the chronicity and the diffuse nature of pain. Chronicity is represented by requiring that patients have at least four consultations for regional musculoskeletal complaints during a five-year period, of which at least three must occur in separate years. However, no documented rationale was given for the choice of these figures. In combination with pain location, the number of episodes of pain offer a means of representing the diffuse nature of the pain.
3. *Pain location*: A measure of the diffuse nature of pain. The criteria specified the need for codes representing at least two different anatomical regions (axial pain, and either upper- or lower-limb pain). This is justified by the observation that few people consulted with pain in three regions.

a. Application

Rohrbeck applied these criteria to a case-control study set in one practice, in which cases were those patients matching his criteria and controls were patients matched for age and gender who had not consulted for regional musculoskeletal problems in the preceding five years (Rohrbeck et al. 2007). He found that cases identified using the criteria consulted for more health problems, and reported worse self-reported general health, more sleep problems, and higher levels of fatigue than controls. The findings of the study indicate that Rohrbeck's criteria had been successful in identifying a patient group similar to that identified by the ACR-2010 criteria with both widespread unexplained musculoskeletal pain and associated somatic symptoms

b. Limitations

However, Rohrbeck's criteria did have some limitations in that the criteria: i) used a limited list of Read codes; ii) included no codes for generalised pain complaints; iii) required consultations for only two body regions based on findings using a limited code set; iv) offered limited documentation on the rationale for the numeric limits used; and v) had received limited validation. Each of these points will now be considered.

i) Limited Read code set

Rohrbeck identified 232 Read codes for regional musculoskeletal pain by undertaking a series of systematic and semantic searches of the Read code directory (Clinical Terminology Browser Version 1.0) (2002, p.72). Systematic searches followed the hierarchical tree structure of the Read code directory. Semantic searches were undertaken by entering relevant terms into the Read code browser. Subsequent examination of a list of Read codes from Chapters 1 (symptoms), N (musculoskeletal problems), R (ill-defined conditions or working diagnoses), and S (injury or poisoning) reveal a substantial number of regional pain codes which are not included in Rohrbeck's list of codes. From the initial list of 232 codes Rohrbeck's final criteria employed a list of 147 unique codes (Rohrbeck 2002, p.88). There was no documented explanation for how or why the list was reduced to this final figure.

ii) No generalised codes

There are two versions of Rohrbeck's criteria: i) the original Rohrbeck-2002 criteria added any patient receiving a code for FM or fibrositis in addition to those fulfilling the criteria listed in Table 2.1; and ii) the Rohrbeck-2007 criteria used for the case-control study include only those fulfilling the criteria (i.e. excluding those with a code for FM or fibrositis). If Rohrbeck's criteria aimed to identify all patients consulting their GP for symptoms of CWP, then both code lists (including and excluding FM and fibrositis pain codes) have the potential to miss patients whose complaints have been coded as generalised pain (e.g. those coded with conditions such as 'general aches and pains' or 'polyalgia').

However, using the code list for regional pain complaints only, Rohrbeck et al.'s (2007) case-control study successfully identified a group of individuals sharing features with CWP patients. Individuals identified using only regional codes are potentially unrecognised, and perhaps not treated, as having a generalised condition; this group of patients therefore, have a potentially unmet need. Consequently, it could be argued that it is more important to identify this group than those who have been recognised as having a generalised pain condition.

iii) Requirement of only two body regions based on findings from limited code set

Rohrbeck justified his requirement for consultation for only two body regions (axial and upper- or lower-limb pain) using the rationale that only 4% of 2,348 patients (questionnaire respondents recruited from one general practice) were found to have consulted for pain in all three regions (axial and upper- and lower-limb pain) during the study period (Rohrbeck 2002, p.79 and p.87). However, this finding was based on a limited Read code set that did not include generalised pain complaints. A more accurate mapping of the ACR-90 criteria may be possible with a more inclusive Read code list.

iv) Limited documented rationale for chronicity limits used in the criteria

The original criteria were applied by taking a snapshot of a predefined five-year period. The 1996–2000 timeframe was selected for convenience, as it was not until 1996 that the study practice was routinely recording all consultations electronically (Rohrbeck 2002, p.91). The choice of this five-year window would therefore seem arbitrary. It could also be argued that the timeframe for assessment of a patient should commence with their first consultation with a musculoskeletal pain complaint, rather than at a predetermined starting time.

The remaining two specifications that attempt to demonstrate the chronicity of the pain complaints are the requirements for: i) at least one consultation for a regional musculoskeletal complaint in each of three separate years; and ii) at least four consultations for regional musculoskeletal complaints in total during the five year period. There is no documented rationale for the choice of these numerical criteria.

v) Limited criteria validation

The model criteria developed by Rohrbeck were initially tested in a sample of only 20 patients from one practice (Rohrbeck, 2002, pp.82–84). Self-reported CWP status was determined using a modified version of the Manchester criteria and was used as a reference standard for evaluating the performance of the criteria (Rohrbeck 2002, p.70). While it could be argued that the characteristics of the patient group returned by the criteria give sufficient validation, this may only be true for the practice where the criteria were developed. Given the variety of coding practices in use (Tai et al. 2007), it is possible that the criteria may not be transferable to consultation data from other general practices. Any further development of the criteria should be tested in a large sample of patients, from a number of different primary care practices, using accepted criteria for CWP as a reference standard.

2.4.2 Developing recurrent regional consulter criteria

The original Rohrbeck-2002 criteria aimed to identify ACR-90 CWP by including patients recorded with FM as well as those recurrently consulting with regional pain. However, by using regional codes only, the 2007 study identified a group of recurrent regional consulters who were potentially unrecognised by their doctors as having a more generalised condition. This group of individuals, with an arguably unmet need, are therefore an important group to identify. They perhaps sit at a less extreme point on the continuum of polysymptomatic distress and express their unmet need through repeated consultations. Development in this thesis of what will be termed the **recurrent regional consulter (RRC)** definition therefore aims to identify individuals with unrecognised polysymptomatic distress (with the defining symptom being widespread and recurrent musculoskeletal pain), based on a consultation pattern for multiple regional musculoskeletal complaints.

2.5 Summary

CWP is a controversial diagnosis. Evidence suggests that it sits within a spectrum of polysymptomatic distress and that patients experience suffering that can be alleviated by appropriate interventions. Many feel that, due to the broad range of symptoms and recommendations for an individually tailored multidisciplinary approach to management, GPs are best suited to deliver care.

CWP patients have been shown to regularly consult for their symptoms. However, with evidence of under-diagnosis of FM in primary care, and since there is no specific morbidity code for CWP, Rohrbeck (2002) suggested that consultations with these patients were being recorded as multiple regional pain complaints. Recurrent consulters for multiple single-site pain complaints are likely to be unrecognised as having a more general pain condition, and therefore unlikely to access appropriate interventions. Through their consultation behaviour recurrent regional consulters are expressing a need that appears to be unmet. Identifying these individuals in primary care is therefore important as it has the potential to improve patient outcomes and reduce consultation demands. This thesis aims to develop an already established definition for identifying a group of recurrent regional musculoskeletal consulters who share features with CWP patients. Characteristics of recurrent regional consulters (RRCs) identified using the definition will be explored to investigate where they fit within the spectrum of polysymptomatic distress.

Despite the extensive literature on clinical features, recognition and management of CWP and FM there has been no extensive review of the prevalence of CWP and FM to determine just how common these are in the general population. The next chapter aims to establish the size of the problem by conducting a systematic review of CWP and FM prevalence.

Chapter 3
Systematic review and meta-analysis of the prevalence of CWP in the general population

3.1 Introduction

Many studies have reported the prevalence of chronic widespread pain (CWP) and fibromyalgia (FM) in the general population. However, there has been no attempt to consolidate these studies to derive a robust prevalence estimate of CWP and FM, and assess how this is influenced by socio-demographic factors and the definition of CWP used. Ascertaining the population prevalence of CWP has important public health implications. For example, clinicians take into account estimates of disease prevalence, and prevalence in different groups of the population (age, sex, ethnicity), when formulating differential diagnoses. It is also difficult to justify research into interventions for conditions whose prevalence is unknown. In addition, these figures were necessary for comparison with coding prevalence figures for non-specific generalised pain complaints calculated in the next chapter to investigate whether FM is under-diagnosed in primary care.

A search of DARE (Database of Abstracts of Reviews of Effects: contains abstracts for published systematic reviews), NHS EED (NHS Economic Evaluation Database: contains abstracts of economic evaluation studies), HTA (Health Technology Assessment database: contains completed and ongoing health technology assessments), Cochrane (a database of systematic reviews) and Medline (contains citations for biomedical literature) databases failed to return any previous reviews of general population prevalence estimates for CWP, although three previous systematic reviews of the more general term ‘chronic pain’ were identified (Verhaak et al, 1998; Nickel and Raspe, 2001; Ospina and Harstall, 2002). Two previous papers have presented a narrative review of chronic pain (Reid et al. 2011, Cimmino et al. 2011), a recent paper (McBeth and Mulvey 2012) has summarised the reported prevalence of CWP from 16 population studies, but is not a systematic review, and another recent paper (Queiroz 2013) has also summarised published FM prevalence and incidence but again is not a systematic review and does not offer a meta-analysis.

This chapter builds on a previous 'modified' systematic review undertaken as a 10,000 word dissertation for a Masters (MRes) qualification by this researcher under her unmarried name (Davidson 2010). Twenty-four papers were included in that review, all were cross-sectional studies. Thirteen gave prevalence figures for FM and eight gave prevalence figures for CWP (three gave figures for both FM and CWP). Estimates for CWP prevalence ranged from 360 to 2,300 per 10,000, with the majority at approximately 1,000 per 10,000. Figures for FM ranged from 6 to 880 per 10,000, with majority between 200 and 400 per 10,000. Twelve papers provided prevalence figures by gender. Most of these studies estimated CWP and FM to be at least two times more common in women. The majority of the studies used ACR-90 case definition criteria. It was not possible to stratify prevalence figures by age due to the variety of presentations of age grouping data provided by the papers included. The prevalence figures observed were consistent across the geographical locations covered by the included papers.

The previous review was restricted by the time and scope constraints for work at the level of a Masters dissertation. It was limited to English language articles and a strict set of eligibility criteria to limit the number of papers included in the review. For example, studies where case definition criteria were felt to be inadequately defined were excluded and articles with study populations restricted by gender, culture, or race were also excluded. No meta-analysis was undertaken.The search only went up to 2nd July 2010. This review can be regarded as a scoping study for the systematic review reported here.

The objective of the systematic review and meta-analysis presented in this chapter was to determine the prevalence of chronic widespread pain in the general population. In the context of this review, chronic widespread pain refers to unexplained, longstanding, diffuse body pain. This is necessarily a broad description since one of the aims of the review is to identify and explore how different definitions of chronic widespread pain might influence the patient groups identified and prevalence. Since this is often a vaguely defined and poorly understood condition, it was hoped that such a comparison would offer further insight into how to best identify patients with this syndrome or to offer a delineation of a severity spectrum. The prevalence of FM, as an arguably more severe manifestation of CWP, therefore necessarily formed part of the study. Sub-grouping of prevalence data by factors such as age and sex offered further insight into the population groups most susceptible to CWP.

The results from the review were used in a number of related strands of follow-up work: i) The community prevalence figures for FM revealed in the review were compared with annual primary care recorded prevalence of FM to test the hypothesis that FM is under-reported in primary care (Chapter Four), offering evidence to justify the need for an alternative means of identifying FM/ CWP consulters in primary care; and ii) CWP community prevalence figures were used as a comparison to consultation prevalence figures of individuals repeatedly consulting for multiple regional pain complaints who share features with patients fitting established CWP criteria (consultation-based CWP based on our recurrent regional consulter definition: Chapter Five).

3.2 Aims and objectives

Primary objective

To estimate the prevalence of chronic widespread pain (CWP) and fibromyalgia (FM) in the general population.

Secondary objective

To determine variation in prevalence by age, sex, geographical location, and criteria used to define CWP and FM.

3.3 Methods

A defined set of search criteria was used to conduct a search of relevant bibliographic databases. The papers returned by the search were evaluated against eligibility criteria and those meeting the criteria were included in the review. The methodological quality of each of the included papers was assessed to attribute appropriate weighting to the conclusions drawn from each study. Data extracted from the studies were analysed and conclusions drawn concerning the methodological quality of each paper. A meta-analysis was then undertaken to calculate pooled prevalence figures.

3.3.1 Reporting

A proposal for reporting the meta-analysis of observational studies in epidemiology (MOOSE) was published in 2002 (Stroup et al. 2002). This provides a useful framework for authors of reviews of observational studies similar to the one proposed here. The PRISMA statement is a more recent 27-item checklist for reporting systematic reviews and meta-analyses; it was published in 2009 as a result of consensus exercise (Liberati et al. 2009). These frameworks were used in the preparation of the final report of this research.

3.3.2 Search strategy

a. Databases searched

The following databases were searched: Medline (Medical Literature Analysis and Retrieval System Online), Embase (Excerpta Medica Database), CINAHL (Cumulative Index to Nursing and Allied Health Literature) and AMED (Allied and Complementary Medicine Database).

Medline is a large biomedical/health bibliographic database containing more than 23 million references from over 5,500 journal titles (National Library of Medicine 2013). The search strategy for this review was initially piloted in Medline.

Embase is a database produced by Elsevier and can be considered the European equivalent of Medline, it contains over 22 million records from over 7,500 biomedical journals published from 1974 (Ovid 2013). A study undertaken by Suarez-Almazor in 2000, found only a 30% overlap between Medline and Embase. A systematic review must therefore search both databases to include all relevant studies.

CINAHL is an index of journal articles about nursing, allied health, biomedicine and healthcare. It indexes more than 3.9 million records from over 5,000 journals from nursing and allied health disciplines (EBSCO 2013). AMED is a database produced by the British Library, it contains more than 279,000 records from up to 600 allied health and complementary medical journals (National Institute for Health and Care Excellence 2013). These two databases were searched in order to return any prevalence research published in nursing, complementary medical or allied health journals not indexed by Medline or Embase.

b. Search terms

The search strategy developed in the initial scoping study was used to interrogate the selected databases; it was piloted and refined with the help of health librarian Rachael Lewis from Keele University's Health Library. Rachael offered guidance on defining the search terms using Boolean operators in an hour-long personal tutorial. The search terms were fine-tuned and developed in the Medline database. The finalised Medline search strategy was then adapted for each of the other databases searched to take into account the equivalent subject headings used in these databases. The strategy is documented in Tables 3.1 and 3.2 (the individual search strategy for each database is documented in appendix A3.1).

Table 3.1 Keywords included in the search strategy for all four databases; terms searched for in the title and abstract of papers

Pain term	chronic widespread pain **OR** fibromyalgia **OR** chronic pain syndrome **OR** diffuse pain **OR** fibrositis **OR** fibromyositis **OR** myofascial pain syndrome
	AND
Study type term	epidemiology **OR** cohort stud* **OR** cohort analys* **OR** cross sectional stud* **OR** cross sectional analys* **OR** observational analys* **OR** prevalence **OR** disease frequency

Table 3.2 Database specific subject heading terms

	Medline - MeSH Headings	**CINAHL - Subject Headings**	**AMED - Subject Headings**	**Embase - Emtree Subject Headings**
Pain term	fibromyalgia myofascial pain syndromes	fibromyalgia myofascial pain syndromes	fibromyalgia pain	fibromyalgia/ epidemiology myofascial pain/ epidemiology
Study type term	prevalence cross-sectional studies epidemiology epidemiologic methods epidemiologic research design epidemiologic studies epidemiologic measurements cohort studies	prevalence cross-sectional studies epidemiology epidemiological research prospective studies	epidemiology	epidemiology prevalence cross sectional study

c. Study retrieval and selection

Medline, Embase, CINAHL and AMED were first searched on 4th April 2011 and an updated search was undertaken on 6th September 2013. The databases were accessed using the OVID search interface (Wolters Kluwer 2013). The titles of the papers returned by the search were examined and any that were obviously irrelevant were excluded. The resulting lists of the candidate papers from each database were then exported to the bibliographic reference management software RefWorks (ProQuest LLC 2013). Here, any duplicate papers were removed. The list of candidate papers (excluding duplicate records) was exported to the desktop reference management software Papers (Mekentosj 2013). The abstracts of the remaining articles were reviewed by this author (Kathryn Mansfield, KM) to find relevant cross-sectional and cohort studies for inclusion in the review. Editorials, letters and conference proceedings were excluded. The full text of the papers short-listed for inclusion was obtained and reviewed and any papers not meeting the eligibility criteria (see section 3.3.3) were excluded. A record was kept of those papers excluded and reasons for exclusion. At each stage a second reviewer (Kelvin Jordan, KJ) was asked to arbitrate on the suitability of any papers for which eligibility was not clear cut.

The second reviewer also calibrated the primary reviewer's application of the eligibility criteria during the paper identification process by assessing for inclusion/exclusion:

1. A random selection of 10% of the abstracts identified after title appraisal of the papers returned by the search strategy.
2. A random selection of 10 or 10% (whichever was the greater) of the full text of papers identified after appraisal of the list of potentially relevant abstracts.

The citations of the retrieved articles were then searched for additional relevant publications.

d. Translation of foreign language publications

Foreign language articles were translated by native speakers.

e. Hand searching

A hand search of the *Journal of Rheumatology* from 1990 was conducted to identify any relevant articles. This journal was identified as the most frequent contributor of articles to the initial scoping study (Davidson 2010).

3.3.3 Eligibility criteria

The eligibility criteria for the study are documented in Table 3.3.

Table 3.3 Inclusion/exclusion criteria

Inclusion criteria	Exclusion criteria
Cohort or cross-sectional observational studies	Conference proceedings, editorials and letters.
Set in primary care or the general population	Studies quoting incidence rather than prevalence figures
Studies since 1990	
Studies where prevalence data (for FM or CWP) can be extracted or calculated	Papers in a foreign language, where resources were not available for full translation
All age ranges	Studies quoting figures for soft tissue rheumatism

The rationale for the implementation of each of the eligibility criteria will now be considered in turn.

a. Inclusion criteria

Cohort and cross-sectional observational studies

In seeking to answer the question "What is the prevalence of CWP in the general population?", cohort and cross-sectional studies as primary observational studies will return the prevalence data necessary. Intervention and case-control studies are likely to use more selective study populations, which will not be transferable to determining prevalence in the general population.

Set in primary care or the general population

To assess the prevalence of CWP in the general population, only research in this predefined population will return applicable data. In the UK 98% of people are registered with a GP (Bowling, 1997); consequently, studies of patients registered with a GP can be considered to be representative of the general population. Therefore, studies of patients on a GP register were selected for inclusion.

Studies published since 1990

The ACR criteria for FM were published in 1990. Prior to this date, extreme heterogeneity in the definition of both CWP and FM would make any comparison of prevalence estimates difficult. In addition, since the prevalence of a disorder is likely to vary over time, it could be argued that to make the results of the review transferable to today's general population, looking at prevalence data from more than 20 years ago may be invalid.

Studies where prevalence data can be extracted, calculated or obtained from the author

To make a judgment regarding the prevalence of CWP/FM these data must be available.

All age ranges

This study aims to ascertain the prevalence of CWP at all age ranges, and therefore papers covering prevalence at any age should be included.

b. Exclusion criteria

Conference proceedings, editorials and letters

Editorials and letters are not primary studies and should therefore be excluded, since articles of these types citing primary research would fail to give sufficient information on which to determine the robustness of the data given. Conference proceedings may cite primary research; however, this is also likely to be published in research papers and proceedings should therefore be excluded as inclusion may result in double counting. Nonetheless, an attempt was made to ensure that any primary research cited by such publications was included.

Studies quoting incidence rather than prevalence figures

The incidence of a condition is the number of newly diagnosed cases in the population at risk during a specific time-period. This review sought to assess the prevalence of CWP rather than the incidence. In addition, incidence figures are likely to be unreliable as it is difficult to get an accurate measure of incidence when diagnosis is based on symptoms being long-standing.

Papers in a foreign language, where resources are unavailable for full translation

Every effort was made to ensure that foreign language papers were translated as exclusion has the potential to introduce bias. There were no foreign language papers that could not be translated.

Studies quoting figures for soft tissue rheumatism

Soft tissue rheumatism is a poorly defined condition that often includes FM along with other regional soft tissue complaints such as bursitis and tendonitis (Burkholder-Krommes 2002). While the prevalence of soft tissue rheumatism may include FM, it is not restricted to widespread unexplained pain complaints. Its prevalence therefore will not reflect the prevalence of CWP or FM.

3.3.4 Methodological quality assessment

The papers selected for inclusion in the review were assessed for methodological quality. A 2007 review of tools for assessing quality in observational studies concluded that there was a lack of a single obvious candidate tool (Sanderson et al. 2007). A modified version of the Newcastle-Ottawa scale (Wells et al. 2008) was used in the initial scoping study. It was modified because the original tool was developed to assess the quality of epidemiological studies examining exposure to a potential causative or therapeutic agent of the disease in question, and consequently was not completely relevant to the papers in this study. There are clearly issues of validity when an existing tool is adapted and the new version is not appropriately tested. In addition, the subjective domain based evaluation that this tool employed proved cumbersome in the scoping exercise and offered no way of efficiently identifying areas of methodological weakness.

This review therefore made use of two tools to assess methodological quality. The first was a tool developed by Walker et al. (2000, cited in Louw et al. 2007) for assessing the quality of low back pain prevalence studies. It provides a checklist of responses to eleven questions covering three domains of methodological quality: A) study participation (Is the final sample representative of the target population?); B) data quality; and C) case definition. The results can be formatted as a summary table of quality for all the papers included in the study, offering an easy reference for identifying which areas of methodology may be poor.

The second tool used in this review uses the two domains of the Quality in Prognosis Studies (QUIPS) tool (Hayden 2007, Hayden et al. 2013) that are relevant to the appraisal of this sort of prevalence study (Domain 1: study participation; Domain 4: outcome measurement). Appraisal of each domain requires a more subjective assessment of risk of bias (low, moderate or high) rather than a separate assessment of a number of different aspects of quality as offered by the first tool.

Both tools are included as part of the data extraction sheet in appendix A3.2.

3.3.5 Data extraction

A data extraction form was used to extract equivalent information from each of the papers (appendix A3.2). This form included details regarding the population sampled, the criteria used to determine diagnosis, the geographical location of the study, prevalence figures, timeframe (for example: point prevalence, annual prevalence) and any subgrouping based on age or gender. It also included fields to capture data relevant to methodological quality assessment using the Walker et al. tool and the two domains of the QUIPS tool (see next section 3.3.4). Data were drawn from the papers using the data extraction tool. For each paper, prevalence figures were extracted or calculated from the available data. Where available, 95% confidence intervals for prevalence figures were extracted from the papers. If not provided in the paper, confidence intervals were calculated using Wilson's method (Newcombe 1998) using data given in the papers. A spreadsheet was created incorporating formulae for calculating the 95% confidence interval for a proportion.

3.3.6 Reliability exercise

A second reviewer (KJ) checked the paper selection, data extraction and quality appraisal stages of the review. In each instance either 10% of the list of studies to be appraised or 10 studies were reviewed, whichever was the larger figure. Any disagreements were discussed. The second reviewer was blinded to the primary reviewer's decisions. A third reviewer (Julius Sim, JS) was available to arbitrate any disagreements that remained unresolved following discussion.

3.3.7 Analysis

a. Descriptive analysis

An initial descriptive account of the papers selected for inclusion in the study was undertaken. Reference was made to the type of studies included (cross sectional or cohort), the sample size, the demographics of the study samples, and the geographical location of the studies. A narrative account of the methodological quality of the papers (using the Walker et al. tool and the participation and outcome measurement domains of QUIPS tool) was then presented. Prevalence figures for CWP and FM were stratified according to the geographical location of the study, case definition criteria and, where possible, age and gender.

b. Meta-analysis

Studies estimating FM or CWP prevalence using the ACR-90 criteria in mixed-gender adults were entered into a meta-analysis. Studies using the same diagnostic criteria in similar populations were used to ensure comparability. The ACR-90 criteria were selected as an established and widely used measure of CWP/FM diagnosis.

Meta-analysis was undertaken using a random-effects model (to account for heterogeneity) and conducted in Stata (StataCorp 2011). Prevalence figures for CWP and FM were visualised graphically using forest plots to compare variability between studies. Heterogeneity between estimates was assessed using the I^2 statistic, which describes the percentage of variation not due to chance across studies. An I^2 value of zero indicates no heterogeneity, values of 25%, 50%, and 75% indicate low, moderate, and high heterogeneity respectively (Higgins et al. 2003). Pooled prevalence figures were calculated with 95% confidence intervals for FM and CWP prevalence.

The impact of study quality on pooled prevalence was assessed by systematically excluding lower-quality studies and studies examining particularly select populations from the meta-analysis. Studies scoring a low risk of bias in both domains of the QUIPS tool were classified as high quality studies, those scoring a high risk in either domain were classified as low quality, while the remaining studies (those scoring either moderate risk in both domains or moderate risk in one and low in the other) were termed intermediate quality. A sensitivity analysis was undertaken by calculating alternative pooled prevalence figures for: i) high- and intermediate-quality studies only; and ii) high-quality studies only.

3.4 Results

3.4.1 Search results

The search returned a total of 4,051 papers: 1,227 from Medline, 1,679 from Embase, 500 from AMED and 645 from CINAHL. Once duplicate records were removed, a total of 2,818 records remained. A flow chart to illustrate the process by which the papers were selected or rejected for inclusion in the study is show in Figure 3.1. To assist readability, when citing more than one paper in this chapter, references are listed in footnotes rather than in the text.

After screening the paper titles, 336 papers were shortlisted for abstract review. During this stage it was decided that papers researching study populations that were exclusively composed of individuals who had been exposed to specific potential risk factors should not be included. These study populations included Holocaust survivors (Ablin et al. 2010b), individuals under chronic traumatic exposure (Ablin et al. 2010a), train crash survivors (Buskila et al. 2009), Gulf war veterans (Stimpson et al. 2006) and populations in specific occupations (Kim et al. 2008). After screening the abstracts of these 336 papers according to the eligibility criteria, 225 papers were excluded, leaving 111 papers for full text review. An additional 15 studies were identified from the citation lists of these 111 papers.

Following review of the full text, 47 papers were excluded (appendix A3.3). Of these 47, sixteen were excluded because prevalence figures for CWP or FM were not quoted and could not be calculated from the information provided in the paper. Eleven of the excluded papers did not present primary research: five were editorials or letters and six were either review articles or used secondary data presented in other papers already included in the review. The citation lists of these papers were scrutinised and any relevant primary research referenced was sourced.

Two studies were excluded because they were neither a cross-sectional nor a cohort study. A further six studies were excluded because the study population was not representative of the general population.

Twelve papers were excluded because they documented data analysed in other papers included in the review. In each instance, the information included in all the available papers has been used to critique the methodological quality of the studies that were included in the review.

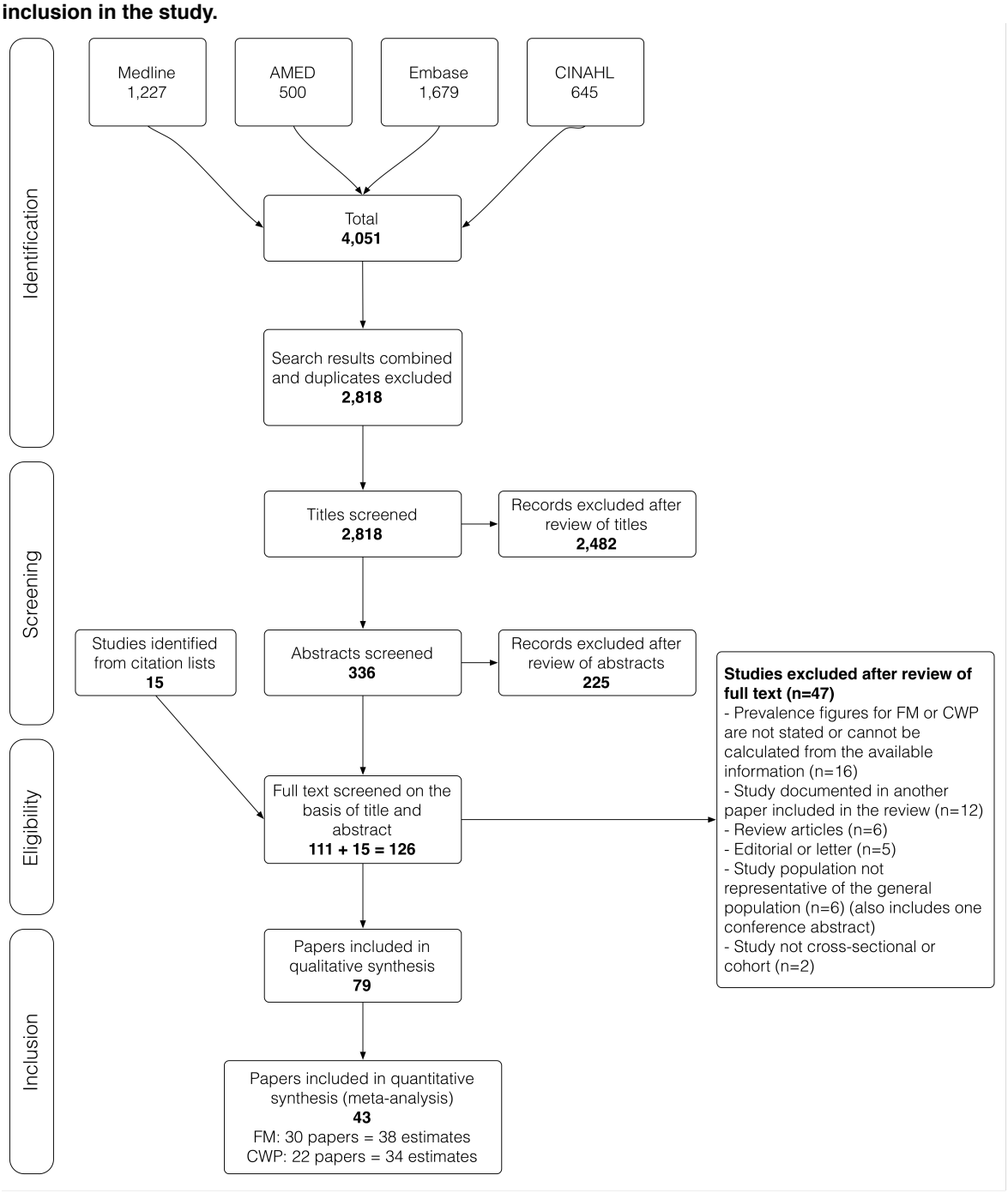
Eleven foreign language papers were identified for possible inclusion in the review[1] all were translated by native speakers (two Norwegian, three German, one Spanish, one Italian, one French, one Taiwanese, one Korean and one Russian).

No additional papers were returned by a hand search of the *Journal of Rheumatology* from 1990.

Seventy-nine papers were therefore selected for inclusion in the review.

[1] Alvarez-Nemegyei et al. 2005 (Spanish), Chen et al. 2008 (Taiwanese), Cimmino et al. 2002 (Italian), Elstad 1994 (Norwegian), Guermazi et al. 2008 (French), Häuser et al. 2009b (German), Häuser et al. 2013 (German), Kim et al. 2006 (Korean), Marschall et al. 2011 (German), Stormorken et al. 1994 (Norwegian), Storozhenko et al. 2004 (Russian).

Figure 3.1 A flow chart to illustrate the process by which the papers were selected or rejected for inclusion in the study.



3.4.2 Reliability exercise

a. Abstract appraisal

A second reviewer (KJ) independently assessed for inclusion a random sample of 10% (27 studies) of the 265 abstracts identified from the list of titles selected from the initial search conducted in 2011 (an updated search was run for literature published between 2011 and 2013 on 4th September 2013). As previously discussed, it was decided that studies of populations exposed to specific potential risk factors should be excluded.

Conversely, it was decided that papers that identified specific social and cultural groups within the general population should be included, as these groups reflected geographically located populations. Consequently, studies researching prevalence in the Amish (White et al. 2003), Pima Indians (Jacobsson et al. 1996), and areas of low socioeconomic status (Assumpção et al. 2009) were included in the review.

b. Full text appraisal

The second reviewer (KJ) then independently assessed the full text of a random sample of 10 papers identified for possible inclusion after review of the list of abstracts. There was no disagreement between the two reviewers regarding the inclusion or exclusion of any of the 10 papers.

c. Data extraction and quality appraisal

The second reviewer (KJ) independently extracted data from a random sample of 10 papers selected for inclusion to validate the use of the data extraction form and the application of the methodological scoring tool.

Discussion between the two reviewers (KM and KJ) concentrated on assessing outcome measurement bias (Domain 4 of the QUIPS tool). It was decided that, if a paper did not present sufficient information about how presence of FM or CWP was measured, it should be scored as at least at moderate risk of outcome measurement bias. Where studies chose to examine only those participants who tested positive to a screening test, it was decided that, if the screening process was unlikely to exclude individuals with FM/CWP, then only examining screen positives would be unlikely to influence the validity of prevalence figures. Therefore the validity and reliability of the

screening process was considered in the assessment for possible outcome measurement bias in these papers.

It was decided during data extraction that studies using medical or insurance records to calculate coding prevalence needed to be considered separately to community prevalence studies. Coding prevalence is unlikely to represent community prevalence since it is reliant on patients' help-seeking and consultation behaviour, and clinicians' diagnostic beliefs and coding practices. These studies were therefore given two additional measures on domain four (outcome measurement bias) of the QUIPS tool: i) one representing how good the specific code(s) identified were as a measure of the recording of the specified condition; and (ii) another representing how good the measure was as an assessment of community CWP or FM prevalence.

3.4.3 Papers included

Of the 79 papers selected for inclusion, three[2] were cohort studies, seventy-six were cross-sectional. Fifty-eight of the included papers gave prevalence figures for FM, while 36 gave figures for CWP (15 papers gave figures for both FM and CWP). Table 3.4 displays the sample size, geographical location, age range and gender of the samples studied by papers included in the review.

Ten[3] of the papers included in the review included estimates for two or more different nationalities or different cultural/ethnic groups living in the same regions. One paper (Andersson et al. 1999) presented both medical record data and the results of a survey that was reported more fully in another paper included in the review (Andersson et al. 1994); only the results of the medical record review from this paper were therefore presented in this review.

The 58 papers presenting figures for FM included one paper (Vincent et al. 2013) providing figures from two separate studies, bringing the total of studies estimating FM prevalence to 59. Of the studies providing figures for FM, three studies provided figures for children or adolescents only, five papers presented figures for adult women only, two papers gave figures for older adults aged 60–75 years plus, and the remaining 48 papers (49 studies) presented FM figures for adults of both genders.

The 36 papers presenting figures for CWP included the results from a total of 38 studies, as: i) Choudhury et al. 2013 presented figures from two studies, a short postal questionnaire and a longer face-to-face questionnaire; and ii) Macfarlane et al. 2005 presented figures from two surveys, one of female adults only and one of mixed-gender adults. Of the studies presenting figures for CWP, four gave figures for women only, one gave figures for men aged 40–79 only, two presented CWP prevalence in older age groups only (age 65–70 years plus), one study looked at prevalence in 45 year olds from the 1958 British Birth Cohort, and one looked at prevalence in 40 to 46 year olds from a Norwegian birth cohort. The remaining 29 studies looked at prevalence in mixed-gender adults.

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[2] Gansky and Plesh 2007, Macfarlane et al. 2009a, and Øverland et al. 2012.

[3] Gansky and Plesh 2007, Macfarlane et al. 2005a, Macfarlane et al. 2009b, Branco et al. 2010, Choudhury et al. 2013, Farooqi and Gibson 1998, Haq et al. 2005, Kurita et al. 2012, White et al. 2003, Zeng et al. 2010.

Table 3.4 Sample size, age range, gender and geographical location of studies included in the review.

Study population	Study	Sample size	Sample Age	Location	FM	CWP
Children and young adults (mixed gender)	Buskila et al. 1993	338	9–15	Israel	✓	
	Clark et al. 1998	548	9–15	Mexico	✓	
	Zapata et al. 2006	359	adolescent	São Paulo, Brazil	✓	
Female adults	Abusdal et al. 1997a	2,622	25–55	Norway		✓
	Cakirbay et al. 2006	1,045	18–55	Trabzon City, Turkey – urban	✓	
	Elstad 1994	3,211	36–55	Norway	✓	
	Forseth & Gran 1992	2,038	20–49	Arendal, Norway	✓	
	Gansky & Plesh 2007	1,334	21–26	USA	✓	✓
	African American	684				
	Caucasian	650				
	Macfarlane et al. 2005 (survey B)		18–36	UK		✓
	South Asian	137				
	White European	121				
	Schochat & Raspe 2003	2,253	35–74	Germany		✓
	Topbas et al. 2005	1,930	20–64	Turkey	✓	
Male adults	Macfarlane et al. 2009b	3,963	40–79	8 European countries		✓
	Belgium (Leuven)	452		Belgium (Leuven)		
	England (Manchester)	590		England (Manchester)		
	Estonia (Tartu)	527		Estonia (Tartu)		
	Hungary (Szeged)	431		Hungary (Szeged)		
	Italy (Florence)	484		Italy (Florence)		
	Poland (Lodz)	408		Poland (Lodz)		
	Spain (Santiago)	548		Spain (Santiago)		
	Sweden (Malmo)	523		Sweden (Malmo)		
Older adults (mixed gender)	Eggermont et al. 2010	585	70+	Boston, USA	✓	✓
	Santos et al. 2010	361	65+	Brazil	✓	✓
Birth cohorts (mixed gender)	Macfarlane et al. 2009a (1958 British birth cohort)	9,377	45	UK		✓
	Øverland et al. 2012 (1953–1957 birth cohort: Hordaland Health Study)	17,706	40–46	Hordaland county, western Norway		✓
Male and female adults	Ablin et al. 2012	1,019	18+	Israel	✓	✓
	Aggarwal et al. 2006	2,299	18–75	Manchester, UK		✓
	Alvarez-Nemegyei et al. 2005	761	18+	Cantamayec, Yucatán, Mexico	✓	
	Alvarez-Nemegyei et al. 2011	3,195	adults	Yucatan, Mexico	✓	
	Andersson 1994	1,609	25–74	Sweden – rural	✓	✓
	Andersson et al. 1999 (1996 medical record figures)	7,474	25–74	Sweden	✓	
	Assumpção et al. 2009	768	35–60	Sao Paulo, Brazil	✓	✓
	Bazelmans et al. 1999	3,881	all	The Netherlands	✓	
	Bergman et al. 2001	2,425	20–74	Sweden		✓
	Branco et al. 2010	4,517	15+	Five European countries	✓	✓
	France	1,014		France		
	Germany	1,002		Germany		
	Italy	1,000		Italy		
	Portugal	500		Portugal		
	Spain	1,001		Spain		
	Buskila et al. 2000	2,210	18+	Israel		✓
	Cardiel & Serrano 2002	2,500	18+	Mexico – suburban	✓	
	Carmona et al. 2001	2,198	20+	Spain	✓	

Study population	Study	Sample size	Sample Age	Location	FM	CWP
Male & female adults	Carnes et al. 2007	2,445	18+	South East, UK		✓
	Chaaya et al. 2012	3,520	15+	Lebanon	✓	
	Chen et al. 2008	1,094	all	Taiwan	✓	
	Choudhury et al. 2013		18+	Tower Hamlets, London, UK		
	Long questionnaire	600				✓
	White British/Irish	294				
	British Bangladeshi	158				
	Bangladeshi	141				
	Short postal survey	1,223				✓
	White British/Irish	571				
	British Bangladeshi	141				
	Bangladeshi	201				
	other ethnic groups	310				
	Croft et al. 1993	1,340	18–85	Cheshire, UK		✓
	Dans et al. 1997	3,006	15+	Philippines	✓	
	Davatchi et al. 2008 urban	10,291	15+	Iran – urban	✓	
	Davatchi et al. 2009a rural	1,565	15+	Iran – rural	✓	
	Farooqi & Gibson 1998	1,997	15+	Pakistan	✓	
	Rural	683		Rural		
	Urban affluent	608		Urban affluent		
	Urban poor	706		Urban poor		
	Guermazi et al. 2008	1,000	15+	Tunisia	✓	
	Hagen et al. 2005	35,751	20+	Nord-Trøndelag, Norway		✓
	Haq et al. 2005	5,211	15+	Bangladesh	✓	
	Rural	2,635		Rural		
	Urban affluent	1,259		Urban affluent		
	Urban slum	1,317		Urban slum		
	Hardt et al. 2008	10,271	20+	USA		✓
	Häuser et al. 2009b	2,524	14+	Germany	✓	
	Häuser et al. 2013	2,510	14+	Germany		✓
	Hughes et al. 2006	1,255, 556	any	UK	✓	
	Hunt et al. 1999	1,953	18–65	UK – suburban		✓
	Jacobsson et al. 1996	105	35–70	Pima Indians		✓
	Joshi & Chopra 2009	8,145	16+	Pune, India – urban	✓	
	Kim et al. 2006	1,028	no age limits	South Korea – rural	✓	✓
	Klemp et al. 2002	689	12+	New Zealand	✓	✓
	Kurita et al. 2012	14,925	16+	Denmark		✓
	Danish	14,033				
	Other Western	395				
	Non-Western	497				
	Lindell et al. 2000	2,425	18–74	Sweden	✓	✓
	Macfarlane et al. 2005 (survey A)		18–75	UK		✓
	South Asian	1,945		South Asian		
	White European	932		White European		
	Mäkelä & Heliövaara 1991	7,217	30+	Finland	✓	
	Marschall et al. 2011	6,897,846	any	Germany	✓	
	McNally et al. 2006	131,535	12+	Canada	✓	
	Minaur et al. 2004	847	15+	Australia	✓	
	Papageorgiou et al. 2002	1,386	27–90	Handforth, UK		✓
	Pelaez-Ballestas et al. 2011	19,213	18+	Mexico	✓	
	Perrot et al. 2011	3,081	18+	France	✓	
	Picavet & Hazes 2003	3,664	25+	Netherlands	✓	
	Prescott et al. 1993	1,219	18–79	Denmark	✓	
	Raspe & Baumgartner 1993	438	25–74	Bad Sackingen, Germany	✓	✓

Study population	Study	Sample size	Sample Age	Location	FM	CWP
Male & female adults	Reyes-Llerena et al. 2000	300	adult	Cuba	✓	
	Reyes-Llerena et al. 2009	3,155	15+	Cuba	✓	
	Rodriquez-Amado et al. 2011	4,713	18+	Mexico	✓	
	Salaffi et al. 2005	2,155	18+	Italy	✓	
	Sauer et al. 2011	1,646,284	all	Germany	✓	
	Scudds et al. 2006	1,467	18–65	Hong Kong	✓	✓
	Senna et al, 2004	3,038	16+	Brazil – urban	✓	
	Storozhenko et al. 2004	120	27–75	Yekaterinburg, Russia		✓
	Svebak et al, 2006	64,690	20+	Norway		✓
	Turhanoglu et al. 2008	600	20+	Turkey – urban	✓	
	Veerapan et al. 2007	2,594	15+	Malaysia	✓	
	Vincent et al. 2013			Olmsted County,		
	Self report	830	21+	Minnesota, USA	✓	
	Medical record review	County population	21+		✓	
	White et al. 1999	3,395	18+	London, Canada – urban	✓	✓
	White et al. 2003		18+	London, Canada – rural	✓	✓
	Amish	179		Amish		
	non-Amish	494		non-Amish		
	Wolfe et al. 1995	3,006	18+	Wichita, USA – urban	✓	✓
	Wolfe et al. 2013	2,445	18+	Germany	✓	
	Zeng et al. 2010		16+	China	✓	
	Shantou	2,350		Shantou		
	Taiyuan	3,916		Taiyuan		
			Total number of studies included		59	38

3.4.4 Methodological quality assessment

a. Walker et al. tool

A summary of the methodological appraisal of the studies included in the review using a tool developed from the Walker et al. tool (Louw et al. 2007) is presented in Table 3.5 (a summary of the items covered by the tool is provided after the table).

Study participation

Sixty-six percent (n=54) of the studies (n=82) were able to demonstrate that the sample had been selected appropriately by: selecting an entire target population, randomly selecting the sample, or stating that the sample represented the target population. Assessment of bias due to non-response and response rate was not applicable to five studies[4] that had used the medical and health insurance records of an entire population. Of the rest, 32 studies (39%) discussed bias due to non-response by: describing reasons for nonresponse; describing non-responders; comparing responders and non-responders; or comparison of sample and target population. Response rates were recorded by 82% (63 of the 77) of the studies where response rates where appropriate.

Quality of the data

Fifty-two percent (n=43) of the studies used the same method of data collection for all subjects. Ninety-three percent (n=76) of the studies collected data directly from the respondent (or, in the case of children, the parents). Where a questionnaire was used (n=73), 56% (n=41) of studies presented some evidence of its validity. Where an interview was used (n=49), 33% (n=16) of studies presented some evidence of interview validity. Where respondents were examined (n=46), 43% (n=20) presented some evidence of measures taken to validate the examination process. Eight-five percent (n=70) of the studies calculated prevalence as a direct estimate from the whole sample, the remaining twelve studies (15%) extrapolated prevalence figures using positive predictive values derived from other populations (e.g. rheumatology outpatients), or from subsamples of responders (e.g. only those examined or only those testing positive on an initial screening test). The majority of studies (94%, n=77) provided clear time points (generally point prevalence) for prevalence estimates.

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[4] Andersson et al. 1999, Hughes et al. 2006, Marschall et al. 2011, Sauer et al. 2011, Vincent et al. 2013 (medical records).

Case definition

Eighty-seven percent (n=71) gave clear diagnostic criteria for outcomes measured.

Table 3.5 Methodological quality appraisal of each study included in the review using the Walker et al. tool

	A1 Sample selection	A2 Non-response	A3 Response rate	B4 Data collection consistent	B5 Data collected directly	B6 Questionnaire validity	B7 Interview validity	B8 Examination validity	B9 Direct estimate of prevalence	B10 Time point for prevalence	C11 Diagnostic criteria stated
	A1	**A2**	**A3**	**B4**	**B5**	**B6**	**B7**	**B8**	**B9**	**B10**	**C11**
Albin et al. 2012	×	×	✓	✓	Directly from respondent	✓	NS	NS	×	✓	✓
Abusdal et al. 1997a	✓	×	✓	✓	Directly from respondent	✓	N/A	N/A	✓	✓	×
Aggarwal et al. 2006	✓	✓	✓	✓	Directly from respondent	✓	N/A	N/A	✓	✓	✓
Alvarez-Nemegyei et al. 2005	×	×	✓	×	Directly from respondent	×	×	×	×	✓	✓
Alvarez-Nemegyei et al. 2011	×	×	×	×	Directly from respondent	✓	×	×	×	×	✓
Andersson 1994	✓	✓	✓	×	Directly from respondent	✓	N/A	×	×	✓	×
Andersson et al. 1999	✓	N/A	N/A	✓	Physician estimate	N/A	N/A	N/A	✓	✓	✓
Assumpção et al. 2009	×	×	✓	×	Directly from respondent	NS	NS	NS	×	×	✓
Bazelmans et al. 1999	✓	✓	✓	×	Medical records	NS	N/A	N/A	✓	×	×
Bergman et al. 2001	✓	✓	✓	✓	Directly from respondent	NS	N/A	N/A	✓	✓	✓
Branco et al. 2010	✓	×	×	✓	Directly from respondent	✓	NS	×	×	✓	✓
Buskila et al. 1993	×	×	×	✓	Directly from respondent and parents	N/A	×	✓	✓	✓	✓
Buskila et al. 2000	✓	✓	✓	✓	Directly from respondent	NS	NS	N/A	✓	✓	✓
Cakirbay et al. 2006	✓	×	✓	×	Directly from respondent	N/A	NS	NS	✓	✓	✓
Cardiel & Serrano 2002	✓	✓	×	×	Directly from respondent	✓	✓	×	×	✓	✓
Carmona et al. 2001	✓	✓	✓	✓	Directly from respondent	✓	✓	✓	✓	✓	✓
Carnes et al. 2007	✓	×	✓	✓	Directly from respondent	NS	N/A	N/A	✓	✓	✓
Chaaya et al. 2012	✓	✓	✓	×	Directly from respondent	✓	NS	NS	✓	✓	✓
Chen et al. 2008	×	×	×	✓	Directly from respondent	×	×	N/A	✓	✓	✓
Choudhury et al. 2013 (long)	×	×	✓	✓	Directly from respondent	✓	NS	N/A	✓	✓	✓
Choudhury et al. 2013 (short)	×	×	✓	✓	Directly from respondent	NS	N/A	N/A	✓	✓	✓
Clark et al. 1998	×	×	×	×	Directly from respondent	NS	✓	✓	✓	✓	✓
Croft et al. 1993	✓	✓	✓	✓	Directly from respondent	✓	N/A	N/A	✓	✓	✓
Dans et al. 1997	✓	✓	✓	×	Directly from respondent	✓	✓	✓	✓	✓	×
Davatchi et al. 2008 (urban)	✓	✓	✓	×	Directly from respondent	✓	✓	×	✓	✓	×
Davatchi et al. 2009a (rural)	✓	×	✓	×	Directly from respondent	✓	✓	×	✓	✓	✓
Eggermont et al. 2010	×	×	×	✓	Directly from respondent	NS	✓	✓	✓	✓	✓
Elstad 1994	✓	×	✓	✓	Directly from respondent	NS	N/A	N/A	✓	✓	×
Farooqi & Gibson 1998	×	×	✓	×	Directly from respondent	✓	×	×	✓	✓	×
Forseth & Gran 1992	×	×	✓	×	Directly from respondent	×	×	×	×	✓	✓
Gansky & Plesh 2007	✓	×	✓	×	Directly from respondent	✓	✓	✓	✓	✓	✓
Guermazi et al. 2008	✓	×	×	×	Directly from respondent	✓	✓	NS	✓	✓	✓
Hagen et al. 2005	✓	✓	✓	✓	Directly from respondent	×	N/A	N/A	✓	✓	✓
Haq et al. 2005	✓	×	✓	×	Directly from respondent	✓	✓	✓	✓	✓	✓
Hardt et al. 2008	✓	✓	×	✓	Directly from respondent	NS	NS	N/A	✓	✓	✓

	A1	A2	A3	B4	B5	B6	B7	B8	B9	B10	C11
Häuser et al. 2009b	✓	✓	✓	✓	Directly from respondent	×	N/A	N/A	✓	✓	✓
Häuser et al. 2013	✓	✓	✓	✓	Directly from respondent	✓	N/A	N/A	✓	✓	✓
Hughes et al. 2006	✓	N/A	N/A	✓	Medical records	N/A	N/A	N/A	✓	✓	✓
Hunt et al. 1999	✓	✓	✓	✓	Directly from respondent	NS	N/A	N/A	✓	✓	✓
Jacobsson et al. 1996	×	×	×	✓	Directly from respondent	NS	NS	N/A	✓	✓	✓
Joshi & Chopra 2009	×	✓	×	×	Directly from respondent	✓	✓	NS	✓	✓	✓
Kim et al. 2006	×	×	×	×	Directly from respondent	NS	×	×	✓	✓	✓
Klemp et al. 2002	×	×	✓	✓	Directly from respondent	N/A	NS	✓	✓	✓	✓
Kurita et al. 2012	×	×	✓	✓	Directly from respondent	NS	N/A	N/A	✓	✓	✓
Lindell et al. 2000	×	✓	✓	×	Directly from respondent	NS	N/A	✓	×	✓	✓
Macfarlane et al. 2005 (survey A)	×	×	✓	✓	Directly from respondent	NS	N/A	N/A	✓	✓	✓
Macfarlane et al. 2005 (survey B)	×	×	×	✓	Directly from respondent	NS	N/A	N/A	✓	✓	✓
Macfarlane et al. 2009a	✓	✓	✓	✓	Directly from respondent	NS	N/A	N/A	✓	✓	✓
Macfarlane et al. 2009b	✓	×	✓	✓	Directly from respondent	✓	N/A	N/A	✓	✓	✓
Mäkelä & Heliövaara 1991	✓	×	✓	×	Directly from respondent	N/A	×	×	×	✓	✓
Marschall et al. 2011	×	N/A	N/A	✓	Medical records	N/A	N/A	N/A	✓	✓	✓
McNally et al. 2006	✓	✓	✓	✓	Directly from respondent	NS	✓	N/A	✓	✓	✓
Minaur et al. 2004	✓	×	✓	×	Directly from respondent	✓	NS	NS	✓	✓	✓
Øverland et al. 2012	×	×	✓	✓	Directly from respondent	NS	N/A	N/A	✓	✓	✓
Papageorgiou et al. 2002	✓	×	✓	✓	Directly from respondent	✓	N/A	N/A	✓	✓	✓
Pelaez-Ballestas et al. 2011	✓	✓	✓	×	Directly from respondent	✓	NS	NS	✓	✓	✓
Perrot et al. 2011	✓	×	✓	✓	Directly from respondent	✓	NS	✓	×	×	✓
Picavet & Hazes 2003	✓	×	✓	✓	Directly from respondent	×	N/A	N/A	✓	✓	×
Prescott et al. 1993	✓	✓	✓	×	Directly from respondent	✓	✓	✓	✓	✓	✓
Raspe & Baumgartner 1993	✓	×	✓	×	Directly from respondent	×	N/A	✓	×	✓	✓
Reyes-Llerena et al. 2000	×	✓	✓	×	Directly from respondent	✓	NS	NS	✓	✓	×
Reyes-Llerena et al. 2009	✓	✓	×	×	Directly from respondent	✓	✓	✓	✓	✓	✓
Rodriquez-Amado et al. 2011	✓	✓	✓	×	Directly from respondent	✓	NS	✓	✓	✓	✓
Salaffi et al. 2005	✓	✓	✓	×	Directly from respondent	NS	NS	NS	✓	✓	✓
Santos et al. 2010	✓	×	✓	×	Directly from respondent	NS	NS	✓	✓	✓	✓
Sauer et al. 2011	×	N/A	N/A	✓	Medical records	N/A	N/A	N/A	✓	✓	✓
Schochat & Raspe 2003	×	×	✓	✓	Directly from respondent	✓	N/A	N/A	✓	✓	✓
Scudds et al. 2006	✓	×	✓	×	Directly from respondent	✓	✓	✓	✓	✓	✓
Senna et al, 2004	✓	×	✓	×	Directly from respondent	✓	NS	NS	✓	✓	✓
Storozhenko et al. 2004	✓	×	✓	✓	Directly from respondent	✓	N/A	N/A	✓	✓	✓
Svebak et al, 2006	✓	✓	✓	✓	Directly from respondent	×	N/A	N/A	✓	✓	✓
Topbas et al. 2005	✓	×	✓	×	Directly from respondent	✓	NS	✓	✓	✓	✓
Turhanoglu et al. 2008	✓	✓	✓	×	Directly from respondent	NS	NS	NS	✓	✓	✓
Veerapan et al. 2007	×	×	✓	×	Directly from respondent	✓	NS	NS	✓	✓	×
Vincent et al. 2013 (Medical records)	✓	N/A	N/A	✓	Medical records	N/A	N/A	N/A	✓	✓	✓
Vincent et al. 2013 (Self-report)	✓	×	✓	✓	Directly from respondent	✓	N/A	N/A	✓	✓	✓
White et al. 1999	✓	✓	✓	×	Directly from respondent	✓	✓	✓	✓	✓	✓
White et al. 2003	✓	×	✓	×	Directly from respondent	✓	NS	NS	✓	✓	✓
Wolfe et al. 1995	✓	✓	✓	×	Directly from respondent	✓	NS	✓	✓	✓	✓
Wolfe et al. 2013	✓	✓	✓	✓	Directly from respondent	✓	N/A	N/A	✓	✓	✓
Zapata et al. 2006	×	✓	✓	✓	Directly from respondent	×	×	NS	✓	×	✓
Zeng et al. 2010	×	×	✓	×	Directly from respondent	✓	NS	✓	✓	✓	✓

NS: No statement; N/A: Not applicable

Modified Walker et al. quality appraisal tool (Louw et al. 2007)

A. Is the final sample representative of the target population?

1. At least one of the following must apply in the study: an entire target population, randomly selected sample, or sample stated to represent the target population.
2. At least one of the following: reasons for nonresponse described, non-responders described, comparison of responders and non-responders, or comparison of sample and target population.
3. Response rate and, if applicable, drop-out rate reported.

B. Quality of the data

4. Was the same mode of data collection used for all subjects?
5. Were the data collected from each respondent directly or were they collected from a proxy?
6. In the case of a questionnaire, at least one of the following: a validated questionnaire or at least tested for reproducibility.
7. In the case of an interview, at least one of the following: interview validated; tested for reproducibility; or adequately described and standardised.
8. In the case of an examination, at least one of the following: Examination validated; tested for reproducibility; or adequately described and standardised.
9. Was prevalence calculated as a direct estimate from the whole sample?
10. Was any statement given regarding time points for prevalence figures (point/period prevalence)?

C. Case definition

11. Were clear diagnostic criteria for CWP/FM stated?

b. QUIPS tool

A summary of the results for the two domains of the QUIPS tool (1. Study participation, 4. Outcome measurement) that were used to assess the methodological quality of the papers included in the review is provided in Table 3.6. A more detailed justification of the risk of bias assigned for each domain is included in the appendix (A3.4 and A3.5).

Table 3.6 Summary of risk of bias in domains 1 and 4 of the QUIPS methodological quality assessment tool for all papers included in the review

Study	Risk of bias related to study participation	Risk of bias related to outcome measurement
Aggarwal et al. 2006	low	low
Bergman et al. 2001	low	low
Buskila et al. 2000	low	low
Carmona et al. 2001	low	low
Croft et al. 1993	low	low
Gansky & Plesh 2007	low	low
Häuser et al. 2013	low	low
Hunt et al. 1999	low	low
Macfarlane et al. 2009a	low	low
Macfarlane et al. 2009b	low	low
Papageorgiou et al. 2002	low	low
Prescott et al. 1993	low	low
Rodriquez-Amado et al. 2011	low	low
Topbas et al. 2005	low	low
Wolfe et al. 2013	low	low
Abusdal et al. 1997a	low	moderate
Cardiel & Serrano 2002	low	moderate
Chaaya et al. 2012	low	moderate
Pelaez-Ballestas et al. 2011	low	moderate
Reyes-Llerena et al. 2009	low	moderate
Salaffi et al. 2005	low	moderate
Svebak et al. 2006	low	moderate
Turhanoglu et al. 2008	low	moderate
Andersson et al. 1999	low	high
Cakirbay et al. 2006	low	high
Häuser et al. 2009b	low	high
Mäkelä & Heliövaara 1991	low	high
McNally et al. 2006	low	high
Hughes et al. 2006	low	coding: low/community: high
Vincent et al. 2013 (medical records)	low	coding: low/community: high
Carnes et al. 2007	moderate	low
Dans et al. 1997	moderate	low
Eggermont et al. 2010	moderate	low
Haq et al. 2005	moderate	low
Macfarlane et al. 2005 (survey A)	moderate	low
Macfarlane et al. 2005 (survey B)	moderate	low
Schochat & Raspe 2003	moderate	low
Scudds et al 2006	moderate	low
Storozhenko et al. 2004	moderate	low
White et al. 1999	moderate	low
White et al. 2003	Amish: low/non-Amish: moderate	moderate
Wolfe et al. 1995	moderate	low

Study	Risk of bias related to study participation	Risk of bias related to outcome measurement
Alvarez-Nemegyei et al. 2005	moderate	moderate
Andersson 1994	moderate	moderate
Davatchi et al. 2009a	moderate	moderate
Farooqi & Gibson 1998	moderate	moderate
Guermazi et al. 2008	moderate	moderate
Hagen et al. 2005	moderate	moderate
Hardt et al. 2008	moderate	moderate
Jacobsson et al. 1996	moderate	moderate
Joshi & Chopra 2009	moderate	moderate
Kurita et al. 2012	moderate	moderate
Minaur et al. 2004	moderate	moderate
Santos et al. 2010	moderate	moderate
Senna et al. 2004	moderate	moderate
Zeng et al. 2010	moderate	moderate
Bazelmans et al. 1999	moderate	high
Branco et al. 2010	moderate	high
Davatchi et al. 2008	moderate	high
Elstad 1994	moderate	high
Forseth & Gran 1992	moderate	high
Picavet & Hazes 2003	moderate	high
Choudhury et al. 2013 (short)	high	low
Clark et al. 1998	high	low
Vincent et al. 2013 (self report)	high	low
Alvarez-Nemegyei et al. 2011	high	moderate
Assumpção et al. 2009	high	moderate
Buskila et al. 1993	high	moderate
Choudhury et al. 2013 (long)	high	moderate
Kim et al. 2006	high	moderate
Klemp et al. 2002	high	moderate
Øverland et al. 2012	high	moderate
Perrot et al. 2011	high	moderate
Zapata et al. 2006	high	moderate
Ablin et al. 2012	high	high
Chen et al. 2008	high	high
Lindell et al. 2000	high	high
Marschall et al. 2011	high	coding: low/community: high
Raspe & Baumgartner 1993	high	high
Reyes-Llerena et al. 2000	high	high
Sauer et al. 2011	high	coding: low/community: high
Veerapan et al. 2007	high	high

Six studies (7%) were felt to be at high risk of bias for both domains of the QUIPS tool (study participation and outcome measurement). Three[5] of these high risk studies did not employ the ACR criteria; one (Chen et al. 2008) failed to adequately operationalise the ACR criteria; one (Ablin et al. 2012) had a low response rate (30%), recruited respondents by telephone only (thereby systematically excluding those without a home telephone) and extrapolated prevalence

[5] Reyes-Llerena et al. 2000, Raspe and Baumgartner 1993, Veerapan et al. 2007

figures from data observed in rheumatology outpatients; and one study (Lindell et al. 2000) demonstrated non-responders to be different from participants completing the outcome measure and may have underestimated prevalence because of long delay between questionnaire and examination, and the examination of only a stratified sample of screen positives. A further two studies[6] used health insurance records to estimate prevalence and were therefore at high risk of selection bias and at high risk of outcome measurement bias for estimates of community prevalence, but at low risk for estimates of coding prevalence.

Study participation

Using the QUIPS tool, 24% (n=20 out of 82 studies included in 79 papers) of the studies included in the review were felt to be at high risk of study participation bias. Thirty-nine percent (n=32) were considered to be at moderate risk, and 37% (n=30) were considered to be at low risk of participation bias.

The main failings in sample selection noted in the high risk studies were non-random sampling of respondents or recruitment from a non-representative sampling frame. Seven used non-random selection methods[7], and seven took their sample from a non-representative sampling frame[8]. Four[9] had to be considered high risk due to low response rates and inadequate documentation regarding the representativeness of study sample.

Of the 82 studies (79 papers) included in the review, 58 used diagnostic criteria based on the ACR-90 and two used the ACR-2010 criteria. Of the 58 studies employing the ACR-90 criteria, 22% (n=13) were deemed to be at high risk of study participation bias. Of the 22 remaining studies, which used case definitions other than ACR-90 or ACR-2010, or failed to clearly state any diagnostic criteria, 27% (n=6) were found to be at high risk of selection bias.

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[6] Marschall et al. 2011, Sauer et al. 2011.

[7] Assumpção et al. 2009, Chen et al. 2008, Choudhury et al. 2013 (long interview), Kim et al. 2006, Klemp et al. 2002, Reyes-Llerena et al. 2000, Veerapen et al. 2007.

[8] Buskila et al. 1993, Clark et al. 1998, Marschall et al. 2011, Øverland et al. 2012, Sauer et al. 2011, Veerapen et al. 2007, Zapata et al. 2006.

[9] Ablin et al. 2012, Choudhury et al. 2013 (short postal questionnaire), Perrot et al. 2011, Vincent et al. 2013 (self-report questionnaire).

Outcome measurement

If we consider our outcome to be community FM/CWP prevalence (rather than coding prevalence), then 26% (n=21) of the included studies were at high risk of outcome measurement bias using the QUIPS tool. Thirty-nine percent (n=32) of the studies were found to be at moderate risk and 35% (n=29) were felt to be at low risk of outcome measurement bias.

For the outcome measurement domain, over half (55%, n=11)[10] of the 20 high-risk studies were rated as such because they used inadequate case definition criteria. They either employed diagnostic criteria that were poorly documented, relied on clinical judgement with no specified diagnostic criteria, or asked for patient recall of physician's diagnosis. Two high-risk[11] studies failed to operationalise established diagnostic criteria adequately. Four studies[12] used non-robust methods to establish prevalence estimates, calculating figures from data extrapolated from a sub-sample or from an unrelated population (e.g. rheumatology outpatients) rather than from the whole sample or the target population. One high-risk study (Cakirbay et al. 2006) failed to provide sufficient documentation regarding the validity of screening test used and the method of outcome measurement and therefore had to be considered high-risk.

Six (7%) of the included studies[13] aimed to estimate the prevalence of clinically recognised FM, rather than community prevalence. Five of the six studies[14] estimating clinically recognised FM established coding prevalence used a clear definition of the codes (recorded in medical/health insurance records) used to represent a FM diagnosis, while the remaining study (Bazelmans et al. 1999) asked GPs to self-report the number of FM patients in their practice (no FM case definition was documented in the paper). The five studies using medical or health insurance records were therefore considered to be at low risk of bias for measuring FM coding as an outcome, but at high

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[10] Albin et al. 2012, Bazelmans et al. 1999, Chen et al. 2008, Davtchi et al. 2008, Elstad et al. 1994, Häuser et al. 2009b, McNally et al. 2006, Picavet and Hazes 2003, Raspe and Baumgartner 1993, Reyes-Llerena et al. 2000, Veerapan et al. 2007.

[11] Mäkelä and Heliövaara 1991, Chen et al. 2008.

[12] Branco et al. 2010, Raspe and Baumgartner 1993, Forseth and Gran 1992, Lindell et al. 2000.

[13] Andersson et al. 1999, Hughes et al. 2006, Marschall et al. 2011, Sauer et al. 2011, Vincent et al. 2013 - medical records, Bazelmans et al. 1999.

[14] Andersson et al. 1999, Hughes et al. 2006, Marschall et al. 2011, Sauer et al. 2011, Vincent et al. 2013 - medical records.

risk for assessing actual community FM burden; while the study asking GPs to self-report FM was considered to be at high risk of bias in determining both coding and community prevalence.

Twelve percent (n=7) of the studies using the ACR-90 criteria (n=58) were felt to be at high risk of outcome measurement bias, compared to 59% (n=13) of the non-ACR (ACR-90 or ACR-2010) studies (n=22).

3.4.5 Prevalence

a. Prevalence estimates

Prevalence estimates for FM ranged from three per 10,000 in China (Zeng et al. 2010) to an upper limit of 1,050 per 10,000 in women aged 20–49 in Arendal, Norway (Forseth and Gran 1992). The majority of estimates for FM prevalence were between 100 and 400 per 10,000 of the population. The majority of figures were either stated or assumed to be point prevalence estimates.

Prevalence estimates for CWP ranged from zero per 10,000, observed in a sample of Pima Indians (Jacobsson et al. 1996), to an upper limit of 2,400 for low socioeconomic status populations in Brazil (Assumpção et al. 2009). The majority of estimates for CWP prevalence were between 1,000 and 1,300 per 10,000 of the population.

A full summary of prevalence estimates and study characteristics is provided in Table A3.8 in the appendix (A3.6).

b. Variation by diagnostic criteria

Fibromyalgia

Prevalence estimates for FM stratified by diagnostic criteria used are presented in Table 3.7 for the studies included in the review that provided figures for both male and female adults.

Of the 49 studies presenting figures for FM in male and female adults, 30 (61%) used the full ACR-90 diagnostic criteria. Three further studies[15] used the ACR-90 criteria but did not examine for tender points. Two studies[16] used the ACR-2010 criteria. Two studies[17] gave figures based on

[15] Chen et al. 2008, Häuser et al. 2009b, Ablin et al. 2012.

[16] Wolfe et al. 2013 and Vincent et al. 2013.

[17] McNally et al. 2006, Picavet and Hazes 2003.

self-reported FM diagnosis. Six studies[18] used diagnostic criteria based on either coding prevalence or prevalence based on GPs' estimates of the prevalence within their practice. One study defined a case according to 'generally accepted definitions among rheumatologists' (Reyes-Llerena et al. 2000). One study used the Yunus et al. criteria (Mäkelä and Heliövaara 1991). Finally, four studies[19] failed to document clear diagnostic criteria.

Estimates for FM prevalence in studies of male or female adults using the full ACR-90 criteria ranged between 3 and 880 per 10,000, with the majority of estimates between 100 and 400 per 10,000. The two studies[20] reporting FM prevalence using the updated ACR-2010 criteria estimated prevalence of 210 and 530 per 10,000.

The two studies[21] calculating recorded prevalence using insurance records had very low prevalence rates when compared with community prevalence figures determined using the ACR-90 criteria (28–45 per 10,000 of the population compared with a figure between 100 and 400 for the majority of studies implementing the ACR-90 criteria). The two studies of FM coding prevalence in insurance records both used German insurance company data; the lower estimate (28 per 10,000) was found in the study requiring two instances of FM coding, while the study with the higher estimate only required one instance of FM coding. Medical record coding prevalence[22] was between 18 and 330 per 10,000.

Prevalence as estimated by GPs (Bazelmans et al. 1999) was very low (16 per 10,000).

The two studies[23] using self-reported recollection of FM diagnosis had low prevalence rates of 110 and 120 per 10,000 of the population.

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[18] Insurance company records: Sauer et al. 2011, Marschall et al. 2011; Medical records: Andersson et al. 1999, Hughes et al. 2006, Vincent et al. 2013 (medical records); GP estimates: Bazelmans et al. 1999.

[19] Andersson 1994, Davatchi et al. 2008, Farooqi and Gibson 1998, Veerapan et al. 2007.

[20] Vincent et al. 2013 (self report), Wolfe et al. 2013.

[21] Marschall et al. 2011, Sauer et al. 2011.

[22] Vincent et al. 2013 (medical records), Hughes et al. 2006, Andersson et al. 1999

[23] McNally et al, 2006, Picavet and Hazes 2003.

Table 3.7 Prevalence of FM per 10,000 of the population for male and female adults stratified by diagnostic criteria used for case definition.

Diagnostic Criteria	Study	Prevalence per 10,000 population (95% CI)
ACR-90 – including tender point examination	Zeng et al. 2010	
	Taiyuan	3 (0, 10)*
	Shantou	10 (0, 30)*
	Joshi & Chopra 2009	5 (1, 13)
	Davatchi et al. 2009a	6 (0, 123)
	Minaur et al. 2004	12 (2, 66)*
	Alvarez-Nemegyei et al. 2011	20 (10, 40)
	Dans et al. 1997	20 (10, 40)*
	Reyes-Llerena et al. 2009	22 (9, 40)
	Prescott et al. 1993	66 (28, 129)
	Pelaez-Ballestas et al. 2011	68 (56, 80)
	Rodriquez-Amado et al. 2011	80 (60, 110)
	Scudds et al. 2006	82 (35, 129)
	Chaaya et al. 2012	100 (60, 130)
	White et al. 2003	
	Non-Amish (rural)	120 (60, 260)*
	Amish	720 (530, 970)
	Lindell et al. 2000	130 (80, 170)
	Alvarez-Nemegyei et al. 2005	130 (60, 240)
	Klemp et al. 2002	130 (10, 240)
	Cardiel & Serrano 2002	140 (100, 200)
	Perrot et al. 2011	160 (120, 200)
	Raspe & Baumgartner 1993	200 (110, 390)*
	Wolfe et al. 1995	200 (140, 270)
	Salaffi et al. 2005	222 (136, 319)
	Kim et al. 2006	224 (150, 333)*
	Carmona et al. 2001	240 (150, 320)
	Senna et al. 2004	250 (197, 312)
	Branco et al. 2010**	290 (240, 360)
	France	140 (70, 210)
	Portugal	360 (200, 520)
	Spain	230 (140, 320)
	Germany	320 (210, 430)
	Italy	370 (260, 480)
	White et al. 1999 (urban)	330 (320, 340)
	Haq et al. 2005	360 (310, 410)*
	Urban slum	320 (230, 440)
	Urban affluent	330 (240, 440)
	Rural	440 (370, 530)
	Assumpção et al. 2009	440 (270, 630)
	Guermazi et al. 2008	670 (530, 840)*
	Turhanoglu et al. 2008	880 (680, 1140)*
Based on ACR-90 criteria (no examination conducted)	Ablin et al. 2012**	200 (130, 270)
	Häuser et al. 2009b	380 (290, 440)*
	Chen et al. 2008	
	Criteria developed from ACR-90	670 (530, 830)*
	Criteria based on LFESSQ	980 (820, 1,170)*
ACR-2010	Wolfe et al. 2013	210 (160, 270)
	Vincent et al. 2013 (self report)	530 (385, 712)
Self-reported recall of diagnosis	McNally et al. 2006	110 (100, 120)
	Picavet & Hazes 2003	120 (90, 160)*

Diagnostic Criteria		Study	Prevalence per 10,000 population (95% CI)
Recorded prevalence	Read codes N248, N239 and N2412 OXMIS code 7339F	Hughes et al. 2006	18 (17, 19)*
	ICD-10 diagnosis M79.7 coded at least twice	Marschall et al. 2011	28 (28, 29)*
	ICD-10 diagnosis M79.7	Sauer et al. 2011	45 (43, 46)*
	Documented FM diagnosis in medical records	Vincent et al. 2013 (medical records)	110 (107, 120)
	ICD-8: 7179; ICD-9: 728	Andersson et al. 1999	330 (290, 370)*
Estimate of practice prevalence provided by GPs		Bazelmans et al. 1999	16 (7, 34)*
Yunus et al.		Mäkelä & Heliövaara 1991	75 (57, 97)*
According to generally accepted definitions among rheumatologists		Reyes-Llerena et al. 2000	70 (20, 240)*
No criteria stated		Davatchi et al. 2008 (urban)	69 (54, 87)*
		Veerapan et al. 2007	93 (62, 137)*
		Andersson 1994	190 (130, 260)*
		Farooqi & Gibson 1998	210 (160, 280)*
		Rural	260 (170, 410)*
		Urban	320 (220, 480)*
		Urban affluent	10 (3, 90)*

*95% CI calculated from sample size and prevalence estimate.
** based on figures for positive screen for LFESSQ-6

Chronic widespread pain

Prevalence estimates stratified by diagnostic criteria for the 29 studies (28 papers) presenting figures for CWP in male and female adults are presented in Table 3.8. Of these 29 studies, 24 (83%) used the ACR-90 criteria, one study additionally used the Manchester criteria (Hunt et al. 1999) with the same study sample, one used ACR-2010 criteria, and four studies used study-specific criteria. In ACR-90 studies CWP prevalence ranged from zero in Pima Indians (Jacobsson et al. 1996) to 2,400 per 10,000 in a low socio-economic status population in Brazil (Assumpção et al. 2009), with the majority of estimates between 1,000 and 1,300 per 10,000.

The study (Hunt et al. 1999) using both the ACR-90 and Manchester criteria with the same sample noted a lower prevalence using the Manchester criteria; 470 per 10,000 compared to 1,290 using the ACR-90 criteria.

Table 3.8 Prevalence of CWP per 10,000 for mixed adults stratified by diagnostic criteria.

Diagnostic criteria	Study	Prevalence per 10,000 population (95% CI)
ACR-90	Jacobsson et al. 1996	0 (0, 350)
	Klemp et al. 2002	280 (160, 430)
	Hardt et al. 2008	360 (310, 420)
	Lindell et al. 2000	420 (340, 500)
	Scudds et al. 2006	440 (340, 550)*
	Ablin et al. 2012	510 (391, 663)*
	White et al. 1999	730 (650, 820)*
	White et al. 2003	
	Non-Amish	890 (670, 1,180)*
	Amish	1,450 (1,010, 2,040)*
	Choudhury et al. 2013	
	Short postal survey	
	White British/Irish	1,000 (200, 1,800)
	British Bangladeshi	900 (0, 2,500)
	Bangladeshi	1,600 (300, 2,800)
	Other ethnic groups	900 (0, 2,000)
	Long questionnaire	
	White British/Irish	600 (0, 1,800)
	British Bangladeshi	900 (0, 2,400)
	Bangladeshi	1,800 (300, 3,300)
	Papageorgiou et al. 2002	1,000 (860, 1,170)*
	Buskila et al. 2000	1,020 (870, 1,110)
	Wolfe et al. 1995	1,060 (950, 1,170)
	Croft et al. 1993	1,120 (960, 1,300)*
	Bergman et al. 2001	1,140 (1,010, 1,260)
	Macfarlane et al. 2005 (survey A)	
	White European	1,180 (990, 1,400)*
	South Asian	1,380 (1,240, 1,550)*
	Raspe & Baumgartner 1993	1,200 (940, 1550)
	Carnes et al. 2007	1,200 (1,080, 1,330)*
	Branco et al. 2010	1,300 (1,200, 1,400)*
	France	1,000 (830, 1,200)*
	Italy	1,000 (830, 1,200)*
	Germany	1,100 (920, 1,310)*
	Portugal	1,300 (1,030, 1,620)*
	Spain	2,300 (2,050, 2,570)*
	Storozhenko et al. 2004	1,330 (838, 2,056)*
	Kim et al. 2006	1,401 (1,202, 1,626)*
	Aggarwal et al. 2006	1,500 (1,367, 1,647)*
	Assumpção et al. 2009	2,400 (2,100, 2,700)
ACR-90 and Manchester	Hunt et al. 1999	
	ACR	1,290 (1,150, 1,450)
	Manchester	470 (390, 570)
ACR-2010: WPI ≥ 6 for 3 months	Häuser et al. 2013	580 (497, 680)*
Study-specific	Hagen et al. 2005	440 (420, 460)*
	Kurita et al. 2012	
	Danish	460 (427, 496)*
	Other Western	405 (251, 648)*
	Non-Western	1,026 (789, 1,324)*
	Andersson 1994	1,070 (930, 1,230)*
	Svebak et al. 2006	1,260 (1,230, 1,280)

*95% CI calculated from sample size and prevalence estimate.
WPI: Widespread pain index (Wolfe et al. 2010)

c. Geographical variation

To ensure comparability for the assessment of geographical variation in prevalence, only adult studies using the ACR-90 criteria have been compared. Tables 3.9 and 3.10 present prevalence figures stratified by study location for FM and CWP respectively.

Fibromyalgia

The studies conducted by White et al. (1999, 2003) in Ontario Canada compare FM prevalence in rural, urban and Amish communities. A substantially higher prevalence of 720 per 10,000 of the population is observed in the Amish community, compared to 120 for rural communities and 330 per 10,000 for the urban population. In contrast, Haq et al. (2005) found a high prevalence in rural Bangladesh compared to both urban affluent and slum communities.

In South America, prevalence estimates were lower in the Mexican and Cuban studies compared to the Brazilian studies. The Mexican and Cuban studies also presented lower estimates than the North American studies.

European estimates ranged from 66 per 10,000 in Denmark (Prescott et al. 1993) to 380 per 10,000 in Germany (Häuser et al. 2009b), with the majority of the estimates between 200 and 350 per 10,000 of the population.

Table 3.9 Prevalence of FM in male and female adults in the general population per 10,000 of the population, stratified by geographical location (for studies using ACR-90 criteria).

Geographical region		Study	Population	Prevalence per 10,000 population (95% CI)
Africa		Guermazi et al. 2008	Tunisia	670 (530, 840)*
Asia	China	Scudds et al. 2006	Hong Kong	82 (35, 129)
	China	Chen et al. 2008 ✣	China	670 (530, 830)*
		Zeng et al. 2010 – Shantou	Shantou, China	10 (0, 30)*
		Zeng et al. 2010 – Taiyuan	Taiyuan, China	3 (0, 10)*
	Korea	Kim et al. 2006	South Korea	224 (150, 333)*
	South East Asia	Dans et al. 1997	Philippines	20 (10, 40)*
	Indian subcontinent	Haq et al. 2005	Bangladesh	360 (310, 410)*
		Rural	Bangladesh – rural	440 (370, 530)
		Urban affluent	Bangladesh – urban affluent	330 (240, 440)
		Urban slum	Bangladesh – urban slum	320 (230, 440)
		Joshi & Chopra 2009	Pune, India – urban	5 (1, 13)
Australasia		Minaur et al. 2004	Australia – Aboriginal community	12 (2, 66)*
		Klemp et al. 2002	New Zealand	130 (10, 240)
Middle East		Davatchi et al. 2009a	Iran – rural	6 (0, 123)
		Chaaya et al. 2012	Lebanon	100 (60, 130)
		Ablin et al. 2012	Israel	200 (130, 270)
		Turhanoglu et al. 2008	Turkey	880 (680, 1140)*
North America	Canada	White et al. 2003		
		Rural Amish	Ontario, Canada – Amish	720 (530, 970)
		Rural non-Amish	Ontario, Cananda – rural	120 (60, 260)*
		White et al. 1999	Ontario, Canada – urban	330 (320, 340)
	USA	Wolfe et al. 1995	Wichita, Kansas, USA	200 (140, 270)
South America	Brazil	Senna et al. 2004	Brazil	250 (197, 312)
		Assumpção et al. 2009	Sao Paulo, Brazil – low socioeconomic	440 (270, 630)
	Cuba	Reyes-Llerena et al. 2009	Cuba	22 (9, 40)
	Mexico	Alvarez-Nemegyei et al. 2011	Yucatan, Mexico	20 (10, 40)
		Pelaez-Ballestas et al. 2011	Mexico	68 (56, 80)
		Rodriguez-Amado et al. 2011	Mexico	80 (60, 110)
		Alvarez-Nemegyei et al. 2005	Cantamayec, Yucatán, Mexico	130 (60, 240)
		Cardiel & Serrano 2002	Mexico – suburban	140 (100, 200)
Europe	Central/ Western Europe	Branco et al. 2010**	Europe	290 (240, 360)
		Branco et al. 2010 – France	France	140 (70, 210)
		Perrot et al. 2011	France	160 (120, 200)
		Raspe & Baumgartner 1993	Germany	200 (110, 390)*
		Branco et al. 2010 – Germany	Germany	320 (210, 430)
		Häuser et al. 2009b	Germany	380 (290, 440)*
		Salaffi et al. 2005	Italy	222 (136, 319)
		Branco et al. 2010 – Italy	Italy	370 (260, 480)
		Branco et al. 2010 – Spain	Spain	230 (140, 320)
		Carmona et al. 2001	Spain	240 (150, 320)
		Branco et al. 2010 – Portugal	Portugal	360 (200, 520)
	Scandinavia	Prescott et al. 1993	Denmark	66 (28, 129)
		Lindell et al. 2000	Halmstad and Laholm, Sweden	130 (80, 170)

* 95% CI calculated from sample size and prevalence estimate.

** based on figures for positive screen for LFESSQ-6

✣ These figures are based on those calculated using an adapted version of the ACR-90 criteria in Chen et al. 2008.

Chronic widespread pain

Figures for ACR-90 CWP in Europe ranged from 420 per 10,000 of the population in Sweden (Lindell et al. 2000) to 2,300 in Spain (Branco et al. 2010) but the majority were between 10,00 and 1,400 per 10,000 of the population. In North America, the Amish had a high prevalence of 1,450 per 10,000 of the population, compared to rural Ontarians with a prevalence of 890 (White et al. 2003) and urban Ontarians with a prevalence of 730 per 10,000 (White et al. 1999). In contrast to the Amish, the Pima Indians of the Gila River community in Phoenix, Arizona had no observed CWP (Jacobsson et al. 1996). The general population in America were found to have a prevalence of 360 per 10,000 of the population by Hardt et al. in 2008 and 1,060 by Wolfe et al. in 1995.

Table 3.10 Prevalence of CWP in the adult general population per 10,000 of the population, stratified by geographical location (for studies using ACR-90 CWP criteria).

Geographical region		Study	Population	Prevalence per 10,000 population (95% CI)
Asia		Scudds et al. 2006	Hong Kong	440 (340, 550)*
		Kim et al. 2006	South Korea	1,401 (1,202, 1,626)*
Australasia		Klemp et al. 2002	New Zealand	280 (160, 430)
Middle East		Buskila et al. 2000	Israel	1,020 (870, 1,110)
		Ablin et al. 2012	Israel	510 (391, 663)*
South America		Assumpção et al. 2009	Sao Paulo, Brazil - low socioeconomic status	2,400 (2,100, 2,700)
North America	Canada	White et al. 2003	Ontario, Canada	
			Amish	1,450 (1,010, 2,040)*
			Non-Amish (rural)	890 (670, 1,180)*
		White et al. 1999	Ontario, Canada (urban)	730 (650, 820)*
	USA	Jacobsson et al. 1996	Pima Indians, Gila River, Arizona	0 (0, 350)
		Hardt et al. 2008	USA	360 (310, 420)
		Wolfe et al. 1995	USA	1,060 (950, 1,170)
Europe	Central/ Western Europe	Papageorgiou et al. 2002	Handforth, UK	1,000 (860, 1,170)*
		Croft et al. 1993	Cheshire, UK	1,120 (960, 1,300)*
		Hunt et al. 1999	Manchester, UK	1,290 (1,150, 1,450)
		Macfarlane et al. 2005 (survey A)	UK	
			White European	1,180 (990, 1,400)*
			South Asian	1,380 (1,240, 1,550)*
		Aggarwal et al. 2006	Manchester, UK	1,500 (1,367, 1,647)*
		Carnes et al. 2007	South East, UK	1,200 (1,080, 1,330)*
		Choudhury et al. 2013	East London, UK	
		Short postal survey	White British/Irish	1,000 (200, 1,800)
			British Bangladeshi	900 (0, 2,500)
			Bangladeshi	1,600 (300, 2,800)
			Other ethnic groups	900 (0, 2,000)
		Long questionnaire	White British/Irish	600 (0, 1,800)
			British Bangladeshi	900 (0, 2,400)
			Bangladeshi	1,800 (300, 3,300)
		Raspe & Baumgartner 1993	Bad Sackingen, Germany	1,200 (940, 1,550)
		Branco et al. 2010	Europe	1,300 (1,200, 1,400)*
		France	France	1,000 (830, 1,200)*
		Italy	Italy	1,000 (830, 1,200)*
		Germany	Germany	1,100 (920, 1,310)*
		Portugal	Portugal	1,300 (1,030, 1,620)*
		Spain	Spain	2,300 (2,050, 2,570)*
	Scandinavia	Lindell et al. 2000	Sweden	420 (340, 500)
		Bergman et al. 2001	Sweden	1,140 (1,010, 1,260)
	Russia	Storozhenko et al. 2004	Yekaterinburg, Russia	1,330 (838, 2,056)*

* 95% CI calculated from sample size and prevalence estimate.

d. Gender variation

Of the 59 studies presenting figures for FM, 35 gave prevalence figures stratified by gender; 30 of these were studies of the adult population. Table 3.11 displays FM prevalence data according to gender. Male-to-female ratio for FM prevalence ranged from zero to 0.97. The majority of studies showed FM to be at least two times more prevalent in women.

Table 3.11 Prevalence (per 10,000) of FM in the adult general population stratified by gender.

Study	Prevalence per 10,000 population (95% CI)		Male:female ratio
	Female	Male	
Alvarez-Nemegyei et al. 2005	260 (140, 480)*	0 (0, 100)*	0.00
Assumpção et al. 2009	780 (500, 1,180)*	0 (0, 60)*	0.00
Chaaya et al. 2012	200 (130, 260)	0 (0, 21)*	0.00
Lindell et al. 2000	116 (71, 191)*	0 (0, 34)*	0.00
Prescott et al. 1993	125 (60, 240)*	0 (0, 60)*	0.00
Senna et al, 2004	390 (310, 480)*	9 (2, 50)*	0.02
White et al. 2003			
Amish	1,040 (610, 1,850)*	30 (7, 89)*	0.03
Non-Amish rural	220 (50, 390)*	0 (0, 194)*	0.00
Haq et al. 2005			
urban affluent	580 (410, 790)	20 (0, 120)	0.03
rural	750 (610, 910)	120 (70, 200)	0.16
urban slum	530 (370, 750)	140 (70, 270)*	0.26
Carmona et al. 2001	420 (320, 560)*	20 (10, 70)*	0.05
Vincent et al. 2013			
medical records	200 (188, 212)	14 (11, 18)	0.07
self report	681 (456, 978)	371 (208, 612)	0.54
Cardiel & Serrano 2002	140 (180, 360)*	10 (40, 60)*	0.07
Picavet & Hazes 2003	210 (150, 270)	20 (0, 40)	0.10
Veerapan et al. 2007	155 (103, 233)*	17 (5, 62)*	0.11
Sauer et al. 2011	40**	5**	0.13
Wolfe et al. 1995	340 (230, 460)	50 (0, 100)	0.15
McNally et al, 2006	180 (170, 200)	30 (20, 40)	0.17
Kim et al. 2006	310 (200, 470)*	57 (16, 205)*	0.18
Klemp et al. 2002	200 (80, 390)*	40 (0, 580)	0.20
Reyes-Llerena et al. 2009	30 (10, 70)*	8 (1, 50)*	0.27
White et al. 1999	490 (470, 510)	160 (130, 190)	0.33
Pelaez-Ballestas et al. 2011	100 (82, 118)	34 (21, 47)	0.34
Guermazi et al. 2008	975 (740, 1270)*	374 (240, 580)*	0.38
Ablin et al. 2012	360 (240, 470)	150 (100, 200)	0.42
Turhanoglu et al. 2008	1,250 (920, 1,670)	510 (310, 820)	0.41
Mäkelä & Heliövaara 1991	98 (71, 133)*	48 (29, 78)*	0.49
Chen et al. 2008***	830 (641, 1,081)*	460 (307, 690)*	0.55
Branco et al. 2010 ✣	360 (350, 370)	210 (200, 220)	0.58
Wolfe et al. 2013	240 (150, 320)	180 (110, 260)	0.75
Häuser et al. 2009b	370 (270, 470)*	360 (270, 490)*	0.97

95% CI calculated from sample size and prevalence estimate.
**Unable to calculate 95% CI from information provided in the paper.
***These figures are based on those calculated using an adapted version of the ACR-90 criteria in Chen et al. 2008.
✣ Figures based on positive screen in LFESSQ-6

Of the 38 studies presenting figures for CWP, 17 gave prevalence by gender, 15 of these were studies of the adult population. Table 3.12 displays CWP prevalence in adults according to gender. Male to female ratio for CWP prevalence in adults ranged from 0.21 to 0.95, with the majority between 0.50 and 0.70.

Table 3.12 Prevalence (per 10,000) of CWP in the adult general population stratified by gender.

Study	Prevalence per 10,000 population (95% CI)		Male:female ratio
	Female	Male	
Buskila et al. 2000	1,400 (1,230, 1,600)	300 (210, 440)	0.21
Kim et al. 2006	1,920 (1,640, 2,240)*	400 (240, 660)*	0.21
Ablin et al. 2012	713 (522, 967)*	300 (183, 489)*	0.42
Bergman et al. 2001	1,530 (1,320, 1,740)	750 (600, 910)	0.49
Klemp et al. 2002	350 (190, 580)	180 (10, 410)	0.51
White et al. 1999	900 (777, 1,023)*	470 (355, 585)*	0.52
Carnes et al. 2007	1,440 (1,264, 1,636)*	818 (669, 997)*	0.57
Croft et al. 1993	1,560 (1,320, 1,840)*	940 (730, 1210)*	0.60
Svebak et al. 2006	1,550 (1,510, 1,590)	950 (910, 980)	0.61
Aggarwal et al. 2006	1,600 (1,230, 1,510)*	1,070 (890, 1,260)*	0.67
Hardt et al. 2008	430 (350, 530)	290 (230, 370)	0.67
Hunt et al. 1999**	530 (410, 670)	370 (260, 520)	0.70
Storozhenko et al. 2004	1,460 (857, 2,386)*	1,050 (417, 2,413)*	0.72
Häuser et al. 2013	630 (509, 770)*	530 (416, 674)*	0.84
White et al. 2003 (Amish)	1,490 (920, 2,310)*	1,410 (810, 2,350)	0.95

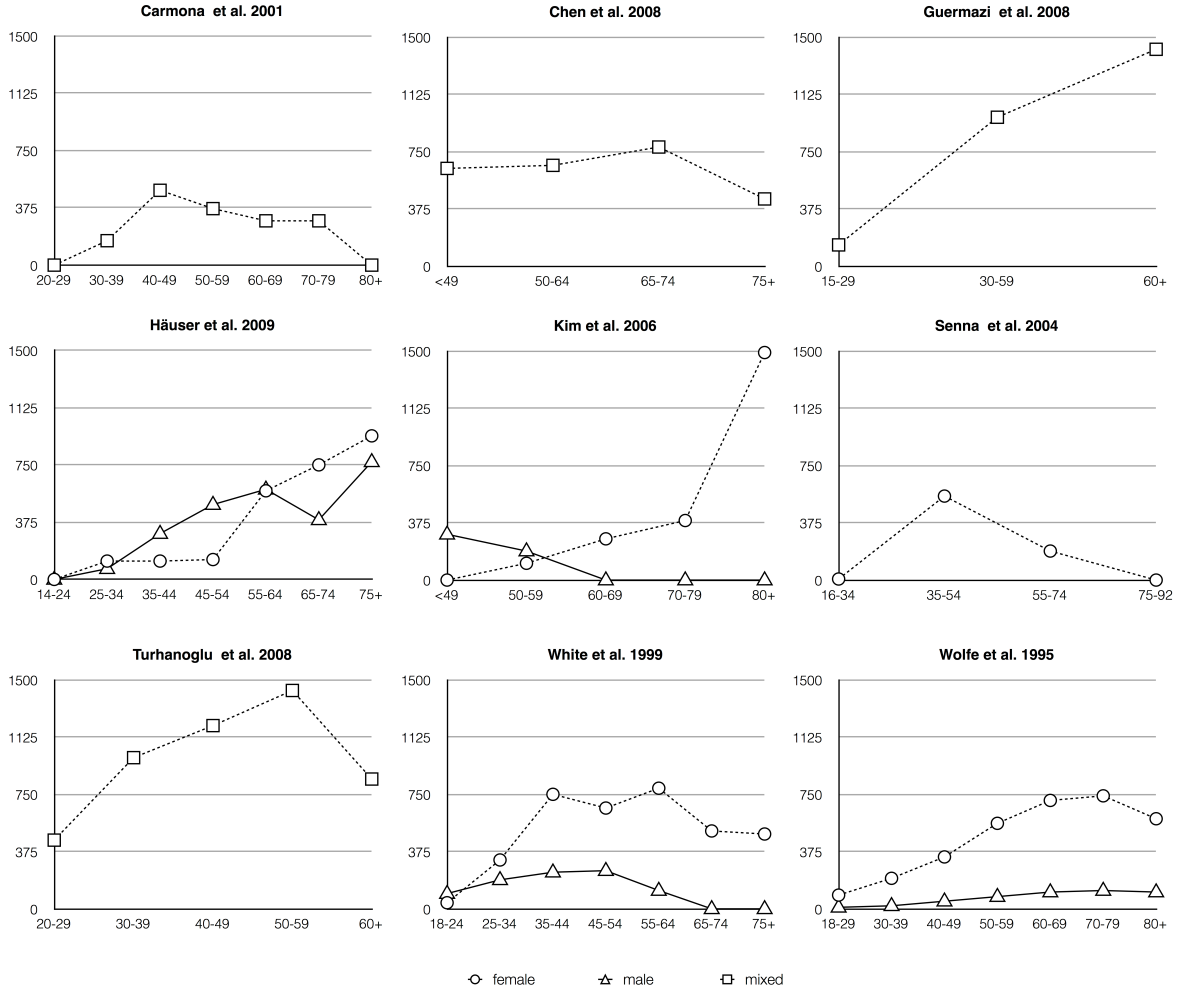
* 95% CI calculated from sample size and prevalence estimate.
** Manchester criteria

e. Age variation

Fibromyalgia

Nine of the papers using the ACR-90 case criteria to diagnose FM presented prevalence figures in both male and female adults stratified by age. These data are summarised in Figure 3.2. The results show the majority of studies demonstrating either increasing FM prevalence with age or a peak in middle age with a decline in older age groups. However, figures for a rural population in South Korea (Kim et al. 2006) show increasing prevalence with age in women, but declining prevalence with age in men.

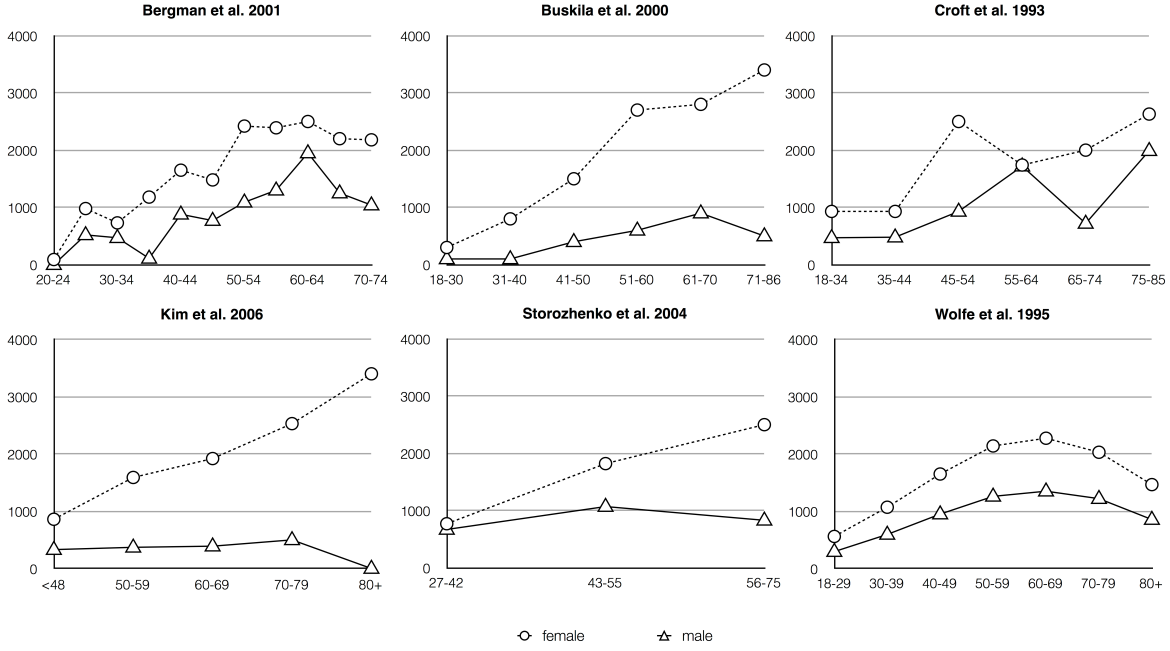
Figure 3.2 Prevalence of FM (per 10,000) in the adult general population for studies using the ACR-90 criteria, stratified by age group.



Chronic widespread pain

Six of the papers presenting figures for ACR-90 CWP in male and female adults presented prevalence stratified by age (Figure 3.3). As for FM there is an increase in CWP prevalence with increasing age and/or a peak in middle age with some studies suggesting a decline in older age groups. Data from Croft et al. (1993) demonstrate two peaks: one in middle age, and another in the elderly. For women there is a peak at age 45–54 and again at 75–85, while for men there is a peak at 55–64 with another at 75–85.

Figure 3.3 Prevalence of CWP (per 10,000) in the adult general population for studies using the ACR-90 criteria, stratified by age group.



3.4.6 Meta-analysis

Studies examining prevalence in both male and female adults using the ACR-90 criteria were included in a meta-analysis. Thirty papers presenting figures for ACR-90 FM prevalence in mixed-gender adults were identified, representing 38 estimates of FM prevalence in different populations.

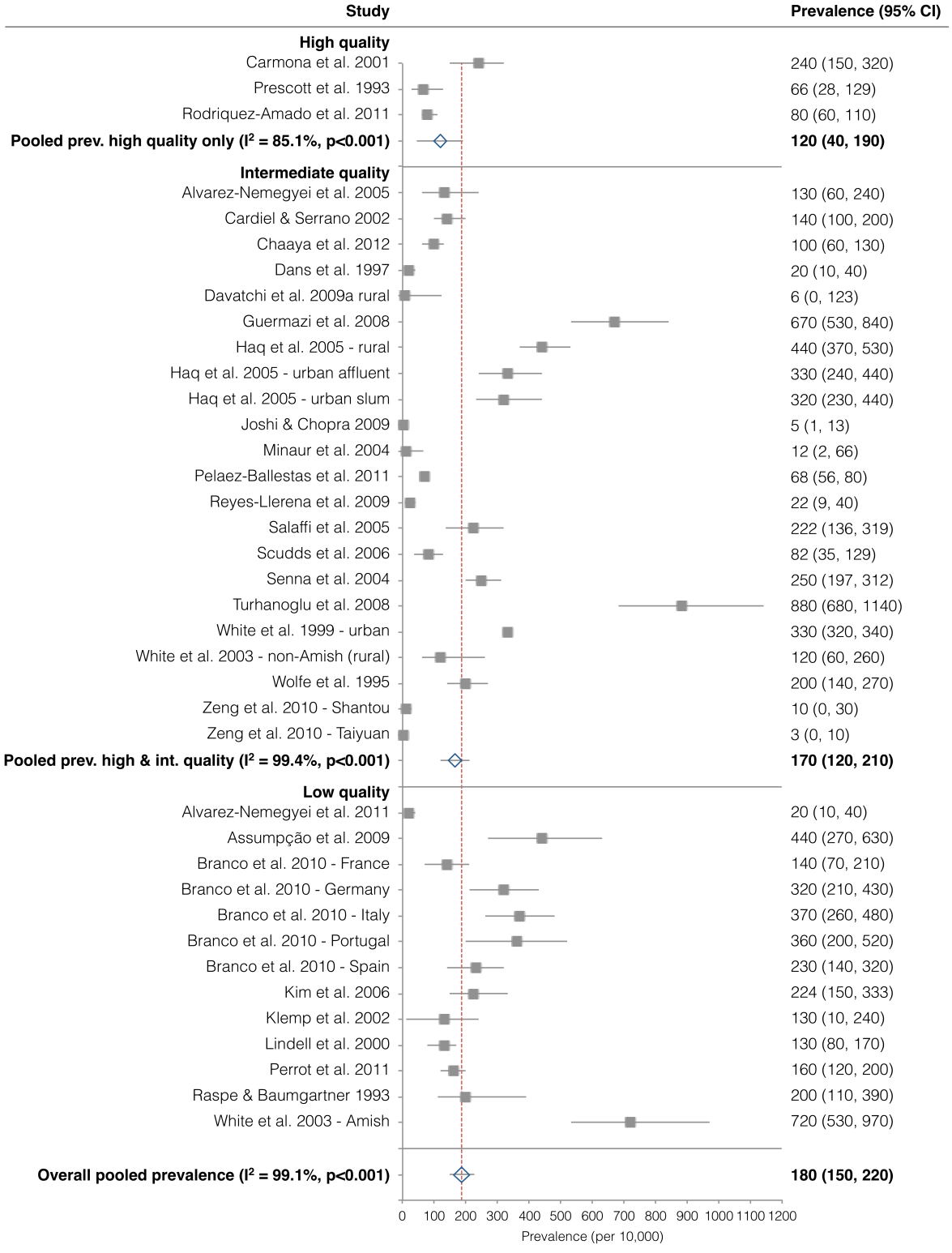
CWP estimates from the Lindell et al. (2000) study were excluded from the meta-analysis because the paper used a slightly different definition that used data from two different time points a year apart. Twenty-two papers presenting figures for CWP were included, representing 34 estimates of CWP prevalence in different populations.

a. Fibromyalgia

The random-effects pooled prevalence of FM for all 38 included estimates was 180 per 10,000 (95% CI 150, 220); this estimate was associated with a high level of heterogeneity (I^2 = 99.1%). There was little difference if low-quality studies (as defined in section 3.3.7.b) and studies estimating prevalence in particularly select populations (White et al. 2003: Amish population) were removed from the analysis – pooled prevalence dropped marginally to 170 per 10,000 (95% CI 120, 210) with a comparable level of heterogeneity (I^2 = 99.4%). When only high-quality studies (studies scoring at low risk of bias on both domains of the QUIPS tool) were considered, pooled prevalence reduced to 120 per 10,000 (95% CI 40, 190), with reduced, but still high, heterogeneity (I^2 = 85.1%).

A forest plot for all 38 estimates of ACR-90 FM prevalence in the adult population stratified by study quality is shown in Figure 3.4.

Figure 3.4 Forest plot for all FM prevalence estimates for ACR-90 studies in the adult population, stratified by study quality.

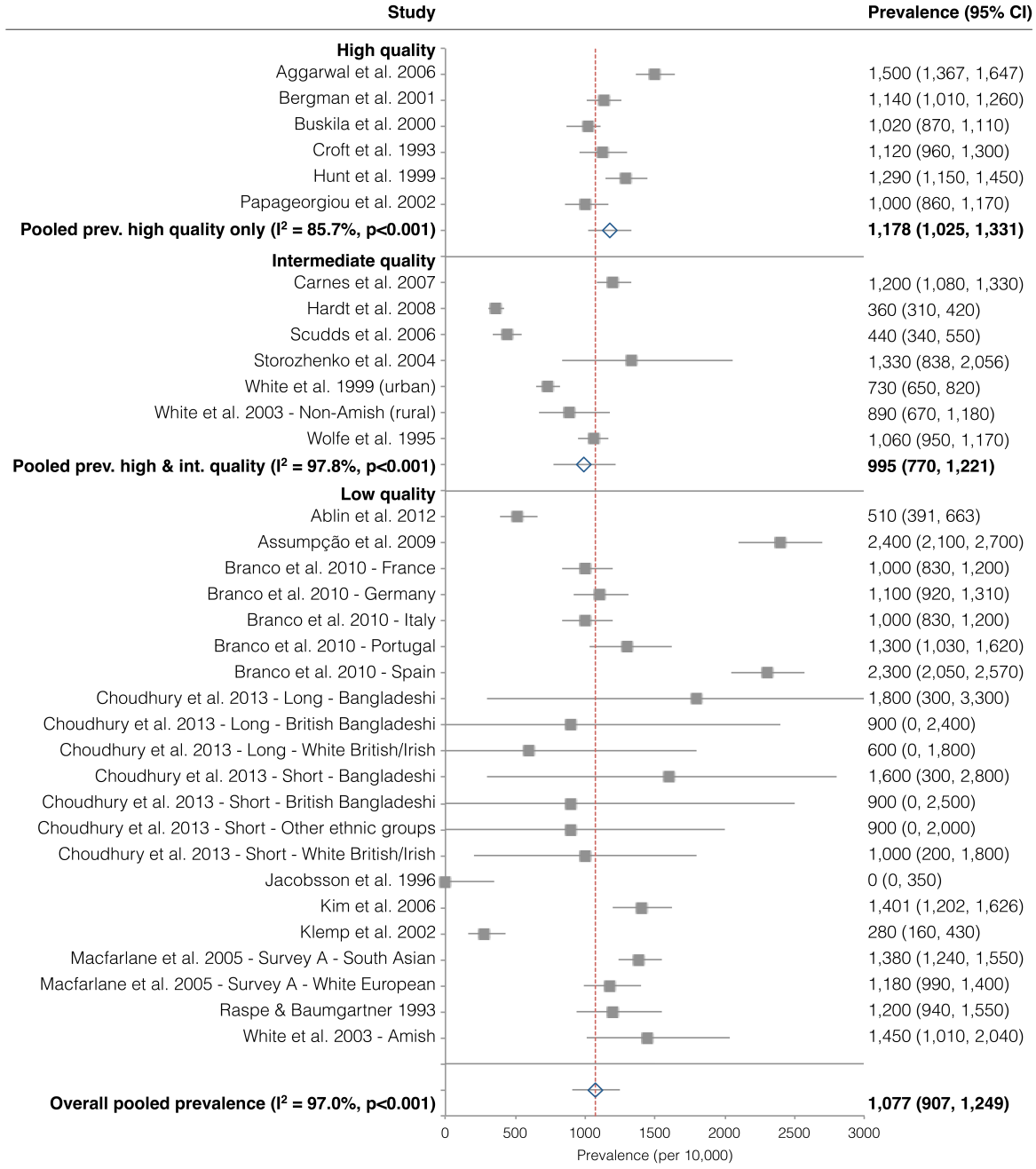


Pooled prevalence estimates calculated using random effects model.

b. Chronic widespread pain

The random-effects pooled prevalence of CWP for all 34 included estimates (from 22 papers) was 1,077 per 10,000 (95% CI 907, 1,249) this estimate was associated with a high level of heterogeneity (I^2 = 97.0%). There was little difference in pooled prevalence if low-quality studies (studies scoring a high risk of bias on either domain one or four of the QUIPS tool) and studies estimating prevalence in particularly select populations (Jacobsson et al. 1996: Pima Indians; White et al. 2003: Amish population; Macfarlane et al. 2005: white European and South Asian) were excluded from the analysis – pooled prevalence dropped to 995 per 10,000 (95% CI 770, 1,221), with comparable heterogeneity (I^2 = 97.8%). When only high-quality studies (studies scoring at low risk of bias on both domains of the QUIPS tool) were considered, there was little change in pooled prevalence: 1,178 per 10,000 (95% CI 1,025, 1,331), with reduced, but still high, heterogeneity (I^2 = 85.7%). A forest plot for estimates of ACR-90 CWP prevalence in the adult population stratified by study quality is shown in Figure 3.5.

Figure 3.5 Forest plot for all ACR-90 CWP estimates from studies in the adult population stratified by study quality.



Pooled prevalence estimates calculated using random effects model.

3.5 Discussion

Seventy-nine papers were included in the review including the results from 82 separate studies. Fifty-nine studies (58 papers) presented prevalence figures for FM, estimates ranged from three to 1,050 per 10,000, with the majority between 100 and 400 per 10,000. Thirty-eight studies (36 papers) presented prevalence figures for CWP: estimates ranged from zero to 2,400 per 10,000, with the majority between 1,000 and 1,300 per 10,000.

Prevalence varied with the diagnostic criteria used to define cases. Generally, recorded prevalence (in medical or health insurance records) was lower than self-reported prevalence. In studies using ACR-90 criteria there was insufficient evidence to demonstrate any geographic variation. However, the papers included in the review suggest that there is appreciable socio-cultural variation.

Prevalence was higher in women for all studies presenting figures stratified by gender. Prevalence was also higher in those over 40 years of age for all studies presenting age stratified figures.

Papers presenting figures using ACR-90 criteria in mixed-gender adults were included in the meta-analysis. The meta-analysis therefore included 30 papers presenting 38 estimates for FM prevalence, and 22 papers presenting 34 estimates for CWP prevalence. All pooled prevalence estimates were associated with high levels of heterogeneity (I^2 ranging from 85% to 99%). Pooled prevalence for FM was 180 per 10,000 for all included studies and 120 per 10,000 for only high-quality studies. Pooled prevalence for CWP was 1,077 per 10,000 for all included studies and 1,178 per 10,000 for high-quality studies only.

3.5.1 Prevalence

With some exceptions, the prevalence estimates were relatively consistent regardless of the range of methodological quality and variation in case definition criteria. For FM estimates for prevalence in mixed-gender adults, 21 (33%) estimates were below 100 per 10,000, eight (13%) were over 400 per 10,000, leaving 54% (n=34) of estimates between 100 and 400 per 10,000. For CWP estimates, 13 (30%) were below 800 per 10,000, seven (16%) were above 1,400 per 10,000, leaving 55% (n=24) of estimates for prevalence in mixed-gender adults between 800 and 1,400 per 10,000.

Particularly low estimates for FM prevalence were found in eleven[24] studies. Four[25] of these studies provided estimates for either recorded (in medical or health insurance records) FM prevalence or estimates of practice prevalence provided by GPs. One (Minaur et al. 2004) estimated prevalence in a select population (Australian Aborigines). Six[26] of these studies did not provide enough documentation to exclude participation bias, and five[27] did not provide enough evidence to exclude outcome measurement bias.

Unusually low estimates for CWP prevalence were found in six[28] studies in mixed-gender adults using ACR-90 criteria. One (Lindell et al. 2000) used a slightly different application of the case definition by using data from two different time points a year apart. Another (Jacobsson et al. 1996) estimated prevalence in a particularly select population (Pima Indians) and three[29] were of poor methodological quality. The low estimate in one study (Hardt et al. 2008) might be explained by data collection methods.

One possible explanation for outliers with low CWP prevalence estimates could be the method of data collection. Of 12 papers[30] presenting CWP prevalence estimates for mixed-gender adults below 1,000 per 10,000 most collected data using an interview (or, in one case, a questionnaire filled in by the respondent with help available from an interviewer) and only three[31] used a postal questionnaire. This is in contrast to studies reporting CWP prevalence estimates greater than

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[24] Zeng et al. 2010, Joshi and Chopra 2009, Davatchi et al. 2009a, Minaur et al. 2004, Alvarez-Nemegyei et al. 2011, Dans et al. 1997, Reyes-Llerena et al. 2009, Hughes et al. 2006, Marschall et al. 2011, Sauer et al. 2011, and Bazelmans et al. 1999.

[25] Hughes et al. 2006, Marschall et al. 2011, Sauer et al. 2011, and Bazelmans et al. 1999.

[26] Zeng et al. 2010, Joshi and Chopra 2009, Davatchi et al. 2009a,, Alvarez-Nemegyei et al. 2011, Dans et al. 1997, and Reyes-Llerena et al. 2009.

[27] Zeng et al. 2010, Joshi and Chopra 2009, Davatchi et al. 2009a,, Alvarez-Nemegyei et al. 2011, and Reyes-Llerena et al. 2009.

[28] Jacobsson et al. 1996, Klemp et al. 2002, Hardt et al. 2008, Lindell et al. 2000, Scudds et al. 2006 and Ablin et al. 2012.

[29] Scudds et al. 2006, Klemp et al. 2002, Ablin et al. 2012.

[30] Jacobsson et al. 1996, Klemp et al. 2002, Hardt et al. 2008, Lindell et al. 2000, Hagen et al. 2005, Scudds et al. 2006, Ablin et al. 2012, Häuser et al. 2013, Choudhury et al. 2013 (long questionnaire), White et al. 1999, White et al. 2003 (Non-Amish), and Kurita et al. 2012.

[31] Lindell et al. 2000, Hagen et al. 2005, and Kurita et al. 2012.

1,000 per 10,000 where all but four[32] of 19 studies[33] (of mixed-gender adults) used a self-completed questionnaire. The American study by Hardt et al. (2008) ascertained CWP status by personal interview, but the other American general population study included in the review (Wolfe et al. 1995) used a postal questionnaire and estimated the prevalence of CWP in Wichita at nearly three times that found by Hardt (1,060/10,000 population).

This suggests that pain reporting is higher when ascertained through self-reported questionnaire than by personal interview. However, one study (Choudhury et al. 2013) used both a short postal survey and longer face-to-face interview using a structured questionnaire to collect data. Findings varied between the three ethnic groups studied; in white British/Irish CWP prevalence was higher in the postal survey group, in British Bangladeshis prevalence was the same in both postal survey and interview groups, and in Bangladeshis prevalence was lower in the postal survey group. This suggests that while for many pain reporting might be high when ascertained through self-reporting, this is not the same in all cultural groups.

Particularly high estimates for FM prevalence were found in three studies[34] using ACR-90 criteria to estimate prevalence in mixed-gender adults. One of these estimates was from a select population (White et al. 2003 Amish). One study investigating FM in Turkey (Turhanoglu et al. 2008) did not provide sufficient evidence to exclude outcome measurement bias and another (Guermazi et al. 2008) investigating FM in Tunisia did not provide enough evidence to exclude risk of selection bias.

Two studies provided CWP estimates higher than 2,000 per 10,000 (Assumpção et al. 2009 and Branco et al. 2010). The study of the low-socioeconomic status population of São Paulo, Brazil (Assumpção et al. 2009) offered the highest prevalence estimate in the review (2,400 per 10,000). This high estimate could be the result of study recruitment methods that were likely to have resulted in bias, or as a result of low socioeconomic status. The association of CWP with low

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[32] Buskila et al. 2000, Branco et al. 2000, Kim et al. 2006, and Assumpção et al. 2009.

[33] White et al. 2003 (Amish), Choudhury et al. 2013 (short postal survey), Papageorgiou et al. 2002, Buskila et al. 2000, Wolfe et al. 1995, Croft et al. 1993, Bergman et al. 2001, Macfarlane et al. 2005, Raspe and Baumgartner 1993, Carnes et al. 2007, Branco et al. 2010, Storozhenko et al. 2004, Kim et al. 2006, Aggarwal et al. 2006, Assumpção et al. 2009, Hunt et al. 1999, Kurita et al. 2012, Andersson 1994, and Svebak et al. 2006.

[34] Turhanoglu et al. 2008, White et al. 2003 (Amish), and Guermazi et al. 2008.

socioeconomic status is consistent with findings from a study of the 1958 British Birth Cohort (Macfarlane et al. 2009a).

The Spanish arm of the study by Branco et al. (2010) returned a high estimate for CWP prevalence of 2,300 per 10,000. Four other countries investigated by this study provide figures that sit within the majority of estimates seen in the review. It is noteworthy that in the same study FM prevalence for Spain is at the higher end of the estimates for all five countries, but is still lower than those of Germany and Italy. It would seem unusual that the prevalence of CWP in Spain should be so high, while that for FM sits in a more typical range. The FM figure provided by the Branco et al. study was 400 per 10,000, while that in another Spanish study (Carmona et al. 2001) is lower at 240 per 10,000. The difference in methods is that Carmona et al. examined all patients while Branco et al. calculated prevalence using a positive predictive value established by applying the questionnaire to patients in rheumatological outpatient clinics. Since the 2001 study used more robust methods, we must assume the lower figure to offer a more reliable estimate.

It could be argued that the two most extreme outliers for CWP prevalence included in the review represent select populations rather than the general population. The highest estimate for prevalence is for a low socio-economic population (Assumpção et al. 2009), while the lowest estimate is in a North American Indian tribal population (Jacobsson et al. 1996). It seems reasonable to suggest that the true estimate for a less select population would sit somewhere between these two extremes.

Care should be taken in interpreting the results of the meta-analysis due to high levels of heterogeneity demonstrated by the high I^2 statistics for the overall figure and the subgroup analysis. With this caveat in mind, if we compare the overall pooled CWP prevalence figure (1,077/10,000) with the pooled figure for high quality studies only (1,178/10,000) there is very little difference, and we see a similar pattern when we compare overall and high-quality FM pooled prevalence estimates. The high level of heterogeneity in pooled prevalence estimates was probably due to methodological differences. Taking a more standard approach to sample selection and outcome measurement might lead to greater consistency in prevalence estimates. However, with the exception of some notable outliers, the evidence provided in this review

suggests that the general population prevalence using ACR-90 criteria for FM is between 100 and 200 per 10,000 and for CWP is between 1,000 and 1,100 per 10,000.

a. Variation by diagnostic criteria

As might be expected, prevalence varied with case definition. GPs estimates of the prevalence of FM in their practice (Bazelmans et al. 1999) were considerably lower than self-reported prevalence estimates for FM. An estimate for FM prevalence based on diagnosis according to generally accepted definitions among rheumatologists (Reyes-Llerena et al. 2000) was also lower than estimates based on standard ACR-90 or ACR-2010 criteria. This is consistent with research suggesting that there is a lack of awareness of the FM diagnosis among doctors (section 2.2.3.b).

Results from medical and health insurance record review were also towards the lower end of estimates based on standard ACR definitions. In a study in Minnesota (Vincent et al. 2013) FM prevalence estimated using ACR-2010 criteria was compared to documented FM diagnosis in medical records. ACR-2010 FM diagnosis was nearly five times that of documented FM diagnosis. These findings are of particular importance to this thesis, since they appear to support the argument that FM is both under-recognised and under-coded.

Two studies reported FM prevalence using the new ACR-2010 criteria, one based in Germany (Wolfe et al. 2013) and one in the USA (Vincent et al. 2013). The German study (Wolfe et al. 2013) estimated prevalence at 210 per 10,000 which was similar to prevalence estimates from Germany based on the earlier ACR-90 criteria. However, the American study (Vincent et al. 2013) estimated prevalence with the ACR-2010 criteria at 530 per 10,000 which was higher than both the pooled ACR-90 prevalence figure from the meta-analysis and the estimate of 200 per 10,000 from another American study that used the ACR-90 criteria (Wolfe et al. 1995).

Another German study (Häuser et al. 2013) used the widespread pain index from the ACR-2010 criteria to estimate CWP prevalence at 580 per 10,000, this was lower than the pooled prevalence estimate from ACR-90 studies.

b. Geographical variation

On examining prevalence figures stratified by geographical locations it is difficult to establish any sort of pattern in the geographical distribution of prevalence estimates. European estimates for CWP and FM show general agreement and are consistent with findings from studies in North America. Smaller numbers of studies from other locations and diverse methodological approaches make comparisons between other regions less straightforward. However, the estimates do show some consistency across locations.

Six[35] of the included studies made comparisons between different ethnic or cultural groups resident in the same regions: All six studies revealed appreciable differences in FM/CWP prevalence between the different ethnic or cultural groups. Whether these differences in the experience of CWP are attributable to lifestyle or genetics is unclear.

The difference in CWP prevalence between Amish and non-Amish (White et al. 2003) might be accounted for by the data collection method used for each population. Non-Amish were assessed using a telephone interview (prevalence 890/10,000) while the Amish were assessed using a self-completed questionnaire (prevalence 1,450/10,000). We have already seen that the majority of low estimates of CWP prevalence were based on studies using an interview to collect data.

The study of Maori and European New Zealanders by (Klemp et al. 2002) also had methodological problems. Participants were recruited from two sources. Those from Maori tribes had to be recruited non-randomly to satisfy cultural beliefs, while the response rate among those recruited from European New Zealanders was low (39%). It would seem likely therefore that the results of this study were influenced by participation bias. However, the study also presents prevalence figures for FM that, unlike the CWP figures, are comparable with FM prevalence figures from other studies included in the review, indicating that there may have been a problem with CWP case identification in this study.

Another study of a tribal community (Jacobsson et al. 1996) also revealed a difference in prevalence compared to other general population estimates. The study identified no cases of CWP in 105 Pima Indians of the Gila River Community, Arizona. Other estimates for CWP in the

[35] Klemp et al. 2002, White et al. 2003, Macfarlane et al. 2005, Gansky and Plesh 2007, Kurita et al. 2012, Choudhury et al. 2013.

USA range from 360 to 1,060 per 10,000. The paper did not provide enough evidence regarding sample selection to judge whether the sample was representative of the target population. It also failed to document any steps taken to validate the questionnaire and interview process. Consequently, it is difficult to assess whether the results are an accurate estimate or the result of methodological problems.

However, with the caveat of likely methodological problems in both studies, when we compare the low prevalence of CWP observed in Maoris (Maori 170/10,000, European 390/10,000) (Klemp et al. 2002) with the absence of observed CWP in Pima Indians (Jacobsson et al. 1996) we must consider there may be reduced CWP in tribal communities.

A number of other studies[36] compared rural and urban regions of the same country, revealing noticeable differences in prevalence. Generally, developing countries had increased prevalence in rural areas compared to urban areas, while developed countries had higher prevalence in urban areas. This suggests that differences in prevalence might be attributable to lifestyle factors.

The study of the low-socioeconomic status population of São Paulo, Brazil offered the highest prevalence estimate in the review (2,400 per 10,000). Study recruitment methods were likely to have resulted in bias: subjects were recruited non-randomly by telephone, 27% of the target population did not have a phone, and 30% of those called did not answer. However, a high rate of CWP in association with low socioeconomic status is consistent with a study using the 1958 British Birth Cohort (Macfarlane et al. 2009a), which demonstrated that low social class is related to an almost threefold increase in CWP risk. Further, another study (Farooqi and Gibson 1998) included in the review demonstrated a lower prevalence of FM in affluent urban communities compared to urban and rural communities. However, a Bangladeshi study (Haq et al. 2005) found similar levels of FM in affluent urban areas and urban slums.

Findings from the review demonstrate cultural and socioeconomic differences in FM/CWP prevalence. Methodological variation between studies make it difficult to draw many conclusions regarding geographical variation, however, there does appear to be some consistency between studies from different locations suggesting limited geographical variation. This suggests that

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[36] Zeng et al. 2010, Haq et al. 2005, Farooqi and Gibson 1998, White et al. 1999 (urban) with White et al. 2003 (non-Amish rural), and Davatchi et al. 2008 (urban) with Davatchi et al. 2009a (rural).

findings from this thesis, which uses data from individuals in North Staffordshire, UK, may be transferable to other populations, particularly other European and North American populations.

c. Gender variation

In all studies providing prevalence by gender, both FM and CWP were observed to be higher in women. On the whole there was a more marked difference between the genders noted in the FM studies compared to the CWP studies.

In one paper (Vincent et al. 2013) comparing self-reported FM prevalence with the prevalence of a diagnosis of FM in medical records, there was a more marked difference between recorded male and female FM prevalence than between self-reported male and female prevalence. This might represent gender-related differences in help-seeking behaviour. Women have been shown to be more likely than men to seek help for symptoms (Cornally and McCarthy 2011, Sayer and Britt 1996). Alternatively, clinicians might be more comfortable with diagnosing FM in women than men.

d. Age variation

Both FM studies and CWP studies demonstrate low prevalence in younger age groups and increasing prevalence towards middle age. It would be reasonable to suggest, therefore, that this is a reliable reflection of patterns of FM/CWP up to around 40 years of age. However, there was some inconsistency between studies in prevalence trends after middle age, with some studies showing prevalence continuing to increase with increasing age, some showing a decline in older age, and some showing two peaks, one in middle age and another in older people. It is unclear whether these differences in age-related prevalence trends are due to methodological differences between studies or true differences in age-related prevalence for different populations. However, the higher-quality FM studies[37] appear to show a decline in prevalence with increasing age, while the higher-quality CWP studies[38] show an overall upward trend in prevalence with age, with a peak in middle age.

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[37] Carmona et al. 2001, Turhanoglu et al. 2008, White et al. 1999, and Wolfe et al 1995.

[38] Bergman et al. 2001, Buskila et al 2000, and Croft et al. 1993.

3.5.2 Future research

Agreeing on a standard case definition for CWP/FM would allow more reliable research into geographical, age, and gender variability. Future research employing standard case definition criteria and using comparable methodology would allow more reliable evaluation of any variation observed in prevalence data between studies. Allied to this is the need for a standardised data collection tool. The calculation of a pooled prevalence figure would be more appropriate if the studies included in the review had implemented equivalent classification criteria and data collection methods. Employing standard case definition criteria and collecting data using a benchmark tool would mean that any variation could be more plausibly attributed to geographical, age, or gender variation, rather than its being as a result of the diagnostic criteria or methodology used. Further research into geographical, age, and gender variation has the potential to provide insight into aetiological factors and the underlying pathophysiology of these conditions. This would have implications for approaches to management.

3.5.3 Strengths and limitations

a. Search and data extraction

The review searched four major bibliographic databases, using a search strategy that had been tested in a pilot study (Davidson 2010), and was able to find reliable translations for all relevant foreign language articles. In addition we searched the citation lists of all papers selected for full text review and hand searched the *Journal of Rheumatology* for relevant papers published after 1990. Moreover, at each step of the review process a reliability exercise was undertaken. A second reviewer (KJ) checked the paper selection (title review, abstract appraisal, full-text review), data extraction, and quality appraisal stages of the review. Any disagreements were discussed and a third reviewer (JS) was available to arbitrate any disagreements that remained unresolved following discussion. The second reviewer was blinded to the primary reviewer's decisions. Our search should therefore have identified most relevant papers. However, we did not undertake a search of grey literature, so there may be unpublished research that should have been included. Nonetheless, with such a large review of a topic where publication bias is unlikely it seems reasonable to conclude that the included studies present a reasonable reflection of the true general population prevalence of CWP and FM.

b. Inclusion of estimates from medical and health insurance records

It could be argued that in a systematic review of general population prevalence, figures for recorded prevalence in medical and health insurance records should not have been included. Recorded prevalence reflects a mixture of consultation behaviour, diagnostic beliefs, and recording practices. However, since FM and CWP are controversial diagnoses recorded prevalence could be argued to provide a measure of the minimum amount of FM/CWP in the community. Further, recorded prevalence figures offer a useful comparison to community prevalence, with the observed disparity offering a convincing justification for the central aim of this thesis. This project is founded on the premise that CWP/FM is unrecognised and unrecorded in primary care, necessitating an alternative means of identifying CWP in morbidity coded data. The observed disparity between coding and community burden supports the theory that CWP is under-recorded.

c. Methodological quality assessment

A systematic review of tools to assess the quality of observational studies examining incidence or prevalence (Shamilyan et al. 2010) concluded that no consensus exists as to which individual criteria should be assessed to establish methodological validity or how to rank overall quality (or indeed whether an overall quality 'rank' is appropriate). It called for a future collaborative effort to develop checklists for quality assessment of observational research. This call for a checklist specifically would seem to be in conflict with the Cochrane Collaboration's advice to assess methodological quality on a subjective basis using domain-based evaluation (Higgins and Green, 2008, section 8.3.1). While the Cochrane Collaboration's recommendations are aimed at systematic reviews of interventions rather than observational studies, their justification for a domain-based assessment, based on the argument that the 'most realistic assessment of the validity of a study may involve subjectivity' (Higgins and Green, 2008, section 8.3.1), still holds true when assessing the risk of bias in observational studies.

Our experience developing and using a tool based on the Newcastle-Ottawa scale (Wells 2008) for quality appraisal in the pilot study informed the choice of tool used in this study. Evaluation of the strengths and weaknesses of the tool used in the pilot study suggested that both a checklist and a tool allowing a subjective assessment of risk of bias in relevant study design domains would be helpful. With no consensus tool available we selected two tools. One was a checklist-based tool (Walker et al. 2000, cited in Louw et al. 2007) and the other asked for a subjective assessment of risk of bias in separate domains (Hayden et al. 2013). Subsequent to the assessment of risk of bias undertaken in this review a 2012 paper (Hoy et al.) published a modified and validated version of the Walker et al. tool for assessing risk of bias in prevalence studies. The modified tool uses both a 10-item checklist (assessing four domains of bias) and a summary rating of either low or high risk of bias, and has been demonstrated to have high interrater agreement (kappa:0.82, 95% CI: 0.76, 0.86). This new tool has therefore addressed the methodological gap that our study sought to address by using two tools. Both of the tools we used were useful in assessing possible reasons for outlying prevalence estimates. However, methodological appraisal is still a subjective exercise, and it was hoped that involving additional reviewers would partially mitigate this.

d. Meta-analysis

Given the varied methodological approaches of the studies included in the review it could be argued that it was not appropriate to calculate pooled prevalence estimates. High heterogeneity between the studies illustrated by the high values of the I^2 statistic certainly supports this argument. However, only studies using the ACR-90 case definition criteria in mixed-gender adults were entered into the meta-analysis. The ACR-90 criteria were selected as an established and widely used standard for CWP/FM diagnosis. Including studies using the same diagnostic criteria in similar populations (male and female adults) ensured some comparability. In addition, prevalence figures were generally consistent (albeit with a few outliers), a random effects model was used to account for heterogeneity, and the impact of study quality on pooled prevalence was assessed by systematically excluding lower-quality studies and studies examining particularly select populations from the meta-analysis.

e. Raw data

No effort was made to contact study authors for raw data. This meant that in some instances, 95% confidence intervals for prevalence estimates had to be calculated from information given in the paper. It also restricted the ability of the research to fulfil one of its objectives, which was to evaluate the variability in prevalence according to age. Of the papers that presented prevalence figures according to age, the age groups used varied considerably, preventing more robust comparisons between studies from being drawn. However, presenting the age-banded prevalence data graphically did allow some useful between-study comparisons to be drawn.

f. Soft tissue rheumatism and myofascial pain syndrome

In the process of conducting the search, three studies returned quoted prevalence figures for soft tissue rheumatism (Davatchi et al. 2009b, Andrianakos et al. 2003) or myofascial pain syndrome (Chaiamnuay et al. 1998). Soft tissue rheumatism is an ill-defined term, applied to painful or inflammatory conditions that are non-articular. It includes both local inflammatory conditions such as bursitis and also more generalized pain syndromes such as CWP and FM (Natvig and Picavet 2002). While the term does not necessarily imply a chronic condition, it certainly encompasses both CWP and FM.

Myofascial pain syndrome was included as a term in the search strategy, but papers presenting prevalence figures for myofascial pain syndrome were excluded from the review. Myofascial pain syndrome and FM are distinct conditions, but they share some common features (Wolfe et al. 1992, Granges and Littlejohn 1993), which was the rationale for including 'myofascial pain syndrome' in the search strategy, but excluding it from the review. Exploring prevalence figures (and variation by geographic location, age, and gender) for myofascial pain would have provided an interesting exploration of distinctions between it and FM/CWP. However, excluding papers calculating myofascial pain syndrome (rather than CWP/FM) prevalence allowed for comparison of individuals identified using comparable criteria for CWP/FM.

g. Incidence

It could be argued that papers quoting incidence figures should also have been included in the study. While incidence is clearly distinct from prevalence, a measure of the number of new cases diagnosed may have allowed interesting comparison with prevalence figures. This could potentially allow conclusions to be drawn regarding the degree to which new cases account for the ongoing burden of disease, and some inferences could therefore be drawn with respect to remission rates.

3.6 Conclusions

CWP is a common problem, women are affected more than men, and those over 40 have a higher prevalence. The 79 papers included in this review returned consistent estimates for the prevalence of CWP and FM. The majority of estimates for CWP were approximately 1,000 to 1,300 per 10,000 (about 10–13% of the population), and for FM ranged between 100 and 400 per 10,000. Pooled CWP prevalence was 1,077 per 10,000 and pooled FM prevalence was 180 per 10,000.

Data recorded between 1998 and 2003 from more than 350 general practices in the UK (representative of 4.6% of the UK population) estimated the prevalence of FM diagnosis recorded in general practice in the UK at 18/10,000 (Hughes et al. 2006). This is substantially lower than the community prevalence figures recorded by studies included in the review. This suggests that FM, and by inference therefore CWP, are vastly under-diagnosed in general practice in the UK, indicating a need for more work to help identify and manage these patients in primary care.

The results from this review were used in a number of related strands of follow-up work. The next chapter compares community prevalence figures for FM revealed by this review to annual primary care consultation prevalence for FM to further test the hypothesis that FM is under-reported in primary care, therefore potentially offering further weight to the argument for developing an alternative means of identifying CWP in primary care. Chapters Five and Six use results from the review to assess how well RRC criteria perform as a means of identifying CWP consulters in primary care. Prevalence figures for consultation-based CWP (RRC) were compared with population figures derived from the review, and the age and gender profiles of RRCs were also compared with the age and gender distribution of CWP in the general population determined by the review, to determine whether RRCs fit the profile for self-reported CWP patients.

Chapter 4
Coding prevalence of non-specific generalised musculoskeletal pain in primary care

4.1 Introduction

In the previous chapter, we established estimates for general population prevalence of FM and CWP in a systematic review and meta-analysis. We also synthesised estimates from previous studies of recorded FM prevalence in medical and insurance data. We noted that recorded FM prevalence estimates were on the whole lower than community prevalence figures, suggesting that FM is under-used as a diagnostic label.

With a possible under-recording of FM in primary care and no specific morbidity code for CWP, it is not clear how consultations with CWP patients are recorded in general practice. Rohrbeck's original recurrent regional consultation (RRC) criteria were developed (to identify CWP consulters in primary care) based on the theory that consultations with patients fitting established CWP criteria were being coded as multiple single-site musculoskeletal complaints (2007). To test the argument that consultations with CWP patients are not being recognised as generalised conditions, this chapter aims to calculate the recorded prevalence of conditions related to CWP in primary care and compare it with annual CWP community prevalence. Community prevalence is, of course, not equal to consulting prevalence, since not all CWP patients will consult their GP for their symptoms. However, a postal survey (Macfarlane et al. 1999) of 252 individuals with ACR-90 CWP, estimated that 72% reported consulting a general practitioner regarding their pain at any time, hence we might expect prevalence of annual recorded CWP to be approximately 72% of community prevalence (i.e. 8% based on reported community prevalence of 11%).

The aim of this chapter is to establish how much CWP is 'recognised' in primary care by establishing the coding prevalence of non-specific (conditions with no clear established underlying alternative diagnosis) generalised pain conditions related to CWP. By estimating any shortfall between 'recognised' CWP (coding of generalised pain conditions related to CWP) and expected CWP consultation prevalence (72% of community prevalence, from Macfarlane et al. 1999), we aimed to evaluate how much 'unrecognised' CWP the RRC criteria would need to

account for. However, there is a problem with such a comparison: the Rohrbeck RRC criteria use five years of consultation data to identify a case and most estimates of community prevalence identified in the systematic review were point estimates. We therefore also aimed to compare both annual and five-year coding prevalence of non-specific generalised pain complaints to establish how much variation there was between short- and long-term estimates for CWP coding.

The existence of FM and CWP as disease entities is controversial (see section 2.2.3). The frequency of coding of these conditions in primary care is therefore a reflection of three different components: i) the population prevalence of the condition; ii) patients' consultation behaviour; and iii) clinicians' diagnostic beliefs and coding practices. By investigating the coding of five different groups of non-specific pain codes (1. FM; 2. FM and myofascial pain; 3. Generalised osteoarthritis; 4. All non-specific generalised pain codes excluding generalised osteoarthritis; and 5. All non-specific generalised pain codes) we were able to explore current coding practices for these conditions.

We used Read-coded GP consultation data from 12 general practices in North Staffordshire contributing to the Consultations in Primary Care Archive (CiPCA). By investigating practice variation we were able to investigate any disparities in coding between practices. We were also able to investigate how comparable coding in the CiPCA practices was to other populations, by comparing FM coding prevalence estimates derived in this chapter with health care recorded FM prevalence from other sources identified in the systematic review (Chapter Three).

4.2 Aims and objectives

The primary aim of this chapter is to establish the coded consultation prevalence of generalised musculoskeletal pain complaints related to CWP in primary care.

Specifically, the objectives of the chapter are:

1. To establish the current coding prevalence of FM in primary care and to compare it with: i) community FM prevalence figures (established in the systematic review presented in Chapter Three); and with ii) other figures for recorded (in medical or health insurance records) FM prevalence reported in the published literature (identified in the systematic review presented in Chapter Three).

2. To compare the coding prevalence of generalised musculoskeletal pain complaints related to CWP (generalised pain conditions with no clear established underlying alternative diagnosis) with general population based estimates for CWP prevalence from a systematic review (Chapter Three). This allows estimation of the prevalence of 'recognised' CWP (coding of non-specific generalised pain) in primary care.

3. To analyse differences in non-specific generalised musculoskeletal pain coding prevalence across five different groups of generalised musculoskeletal pain codes, to explore the prevalence of coding of different conditions related to CWP:
    - Group 1: Fibromyalgia codes.
    - Group 2: Fibromyalgia, fibrositis, and myofascial pain syndrome codes.
    - Group 3: Generalised osteoarthritis codes.
    - Group 4: All non-specific generalised musculoskeletal pain codes excluding any codes for osteoarthritis.
    - Group 5: All non-specific generalised musculoskeletal pain codes.

4. To analyse trends in annual coding prevalence over time for generalised musculoskeletal complaints related to CWP.

5. To assess variation in generalised musculoskeletal pain coding prevalence by age, gender, and practice.

6. To calculate five-year coding period prevalence figures for generalised pain conditions related to CWP, to offer data to compare with figures generated using the original Rohrbeck recurrent regional consulter criteria, which require a five-year period for case identification.

4.3 Methods

4.3.1 Data

Annual coding prevalences were calculated using routinely recorded morbidity data stored in the Consultations in Primary Care Archive (CiPCA). The CiPCA dataset contains anonymised primary care consultation data for up to 13 (depending on year) general practices in the North Staffordshire area of the UK. Although North Staffordshire is generally quite deprived in comparison to the average for England, these practices cover both more affluent and more deprived areas.

Information stored includes a unique patient identifier, the event date, and the Read code and Read term for the complaint or complaints addressed during the consultation. The practices involved are part of the Keele GP Research Partnership; consequently routine clinical data recorded by the practices is regularly audited by the informatics team from the Research Institute of Primary Care and Health Sciences Research at Keele University (Porcheret et al. 2004). The data quality has been demonstrated to be similar to that of larger national primary care consultation databases giving comparable musculoskeletal consultation prevalences to national UK and international databases (Jordan et al. 2007, 2013). At least one morbidity code is required to be entered for each contact to the practice.

4.3.2 Identification of Read codes

Five groups of Read codes representing non-specific (i.e. with no clear established underlying alternative diagnosis) generalised pain conditions related to CWP were identified:

- Group 1: Fibromyalgia codes
- Group 2: Fibromyalgia, fibrositis, and myofascial pain syndrome codes
- Group 3: Generalised osteoarthritis codes
- Group 4: All non-specific generalised musculoskeletal pain codes excluding any codes for osteoarthritis
- Group 5: All non-specific generalised musculoskeletal pain codes.

The Read codes to include in the study were identified through a systematic search of all Read codes in Chapters 1, N, R, and S. Chapter 1 contains codes for symptoms, N codes for musculoskeletal problems, R ill-defined conditions or working diagnoses, and S covers injury or poisoning codes.

In a previous study (Jordan et al. 2010), two research GPs independently identified 5,182 unique Read codes (representing 5,908 clinical terms; some Read codes are associated with multiple synonymous clinical terms) from Chapters 1, N, R, and S as being musculoskeletal in nature. A team of four GPs then allocated each musculoskeletal code to an individual body region (e.g. hand, knee, back) where possible. If the codes did not specify an individual body region they were classified as 'site unspecified.' Using this classification, initially we identified all generalised musculoskeletal codes from the list of 'site unspecified' codes. Generalised pain codes were defined as those for conditions that are generalised by definition (e.g. FM) or had clinical terms that included expressions such as: 'multiple sites' or 'generalised.' In addition, we identified site unspecified pain codes that could represent either regional or generalised pain; that is, codes with musculoskeletal pain clinical terms that were broad and inclusive, but did not necessarily imply a single site (e.g. 'other tendon disorders', 'arthralgia – site unspecified', 'rheumatic pain') and therefore had the potential be used to represent generalised pain.

From this list of codes, the aim then was to identify codes that could represent idiopathic diffuse pain syndromes. An advisory panel of six GPs and a rheumatologist were approached for their advice regarding coding practices for consultations with patients who present to their GPs with

symptoms of CWP. Two of the panel had specialist musculoskeletal research interests and worked both clinically and within the Arthritis Research UK Primary Care Centre at Keele University. The remaining five clinicians were members of the North Staffordshire GP Research Network (Porcheret et al. 2004) with no special musculoskeletal interest. In a series of mainly one-to-one sessions (with KM), the GPs discussed how they would routinely code consultations with patients who present with medically unexplained musculoskeletal pains. While there was a diversity of coding practices in use among the panel members, there was a clear consensus regarding the codes that would be unlikely to identify CWP patients. All agreed that the following musculoskeletal complaints were unlikely to represent CWP patients: clearly identified underlying pathology (determined via clear investigative evidence, secondary care diagnosis or strong clinical indication); injury or trauma; vertebral conditions with myelopathy; structural problems (e.g. fractures); and strains or sprains. Codes were therefore excluded from the list of all generalised Read codes if they represented any of the conditions agreed by the advisory panel as unlikely to represent CWP.

The remaining non-specific generalised codes were then categorised into the five code groups outlined above. Full code lists for each group are presented in the appendix (A4.1). Group one comprised the only two specific Read codes for fibromyalgia. Group two included eight codes covering FM (including the two codes in group one), fibrositis, muscular rheumatism, and myofascial pain syndrome. Myofascial pain syndrome and FM are distinct conditions, but they share some common features (Wolfe et al. 1992, Granges and Littlejohn 1993). Group three included 11 codes for generalised osteoarthritis. Osteoarthritis was included since it was considered by the advisory panel as a diagnostic label that might be used for older patients presenting with generalised musculoskeletal pain. The remaining two groups comprised all non-specific generalised pain codes either including (n=110), or excluding (n=99), generalised osteoarthritis codes.

4.3.3 Analysis

To assess the generalisability of the study population to the general population, the age and gender distribution of patients registered with the CiPCA practices were compared with the UK general population. Patients registered with the CiPCA practices in each year (mid-year figures) from 2005 to 2009 and patients registered with the practices for the full five-year period (2005–2009: registered both mid-year 2005 and mid-year 2009) were compared with the 2009 UK general population (mid-year figures from the Office for National Statistics 2011).

a. Prevalence

The annual and five-year consultation prevalence for each code group was calculated for the 12 practices in the CiPCA dataset for which there were complete data for the years 2005–2009. Prevalence figures were recorded per 10,000 population. Prevalence was calculated only for consultations conducted in primary care; coded hospital consultations were not included. Repeat codings for the same patient were excluded in order to identify the number of patients coded with specific conditions rather than the number of consultations for those conditions. For annual prevalence figures the denominator population was the mid-year registered population for all 12 practices. Five-year prevalence figures for all patients consulting (including those not registered for the full five-year period) were calculated using 2009 mid-year registered population as the denominator. Finally, five-year figures were also calculated for the fully registered (2005–2009) population only, using all patients registered for the duration of the five-year study period as the denominator (recorded as registered mid-year 2005 and mid-year 2009).

Confidence intervals for prevalence figures were calculated using Wilson's method (Newcombe 1998). A spreadsheet was developed for this purpose, incorporating formulae for calculating these intervals at the 95% confidence level.

Both crude and standardized figures were calculated. Prevalence figures were directly standardized to the UK general population age-gender structure (mid-year 2009 figures) provided by the Office for National Statistics (2011). A spreadsheet was developed incorporating formulae for calculating standardised prevalence estimates with 95% confidence intervals (using direct standardization as documented in Altman et al. 2000, p.70–71).

Prevalence figures for each code grouping were compared with community and recorded (medical and insurance records) prevalence figures derived from a systematic review of the prevalence of CWP/FM in the general population (see Chapter Three).

b. Annual variation

Trends over time for the recording of each diagnostic code group were examined descriptively by determining annual prevalence figures for the years 2005 to 2009. A ratio of 2009 to 2005 figures was also calculated to quantify any changes in prevalence over time.

c. Practice variation

Crude and standardised (standardised directly to the 2009 UK general population) annual prevalence figures (and 95% confidence intervals) for 2009 were calculated for each of the 12 participating practices using the 2009 mid-year registered population as the denominator. Inter-practice variation was examined descriptively by comparing crude and standardised prevalence estimates for each code group across practices

d. Age and gender variation

Annual (2009) and five-year (2005–2009, fully registered only) prevalence was stratified for each Read coded grouping by age and gender. The age stratification was in the following age bands: 14 and under; 15–24; 25–44; 45–64; 65–74; 75 years and over – as used in other studies in the Arthritis Research UK Primary Care Centre at Keele University. Confidence intervals were calculated at the 95% level, as before.

4.4 Results

Table 4.1 shows the age and gender distribution of the study population between 2005 and 2009, and the UK population in 2009 (Office for National Statistics 2011). Between 2005 and 2009 there was a slight increase in the number of patients registered with the 12 practices contributing to CiPCA, but the age and gender distribution of the registered population remained stable for the five-year period (2005–2009). Patients fully registered with the CiPCA practices for the whole five-year duration of the study period (2005–2009) were comparable on gender to the total number of patients registered in each individual year (2005 to 2009). However, the population fully registered for the full five-year period comprised a higher percentage of those over 45 years and a lower percentage of under 14s than those registered in each individual year.

Both the total number of patients registered with the CiPCA practices in the individual years from 2005 to 2009, and those fully registered for the five-year period (2005–2009), were comparable on gender distribution with the UK 2009 population. However, the CiPCA population had a higher percentage of older people than the UK general population, with a higher percentage aged 45 and over, and this difference was more marked in the fully registered population.

Table 4.1 Comparative demographic data for the CiPCA registered population 2005–2009 and the UK general population for 2009 (source Office for National Statistics, National Records of Scotland, Northern Ireland Statistics and Research Agency).

	CiPCA population – frequency (%)						UK General Population mid-year figures 2009*
	2005	2006	2007	2008	2009	Fully registered 2005–2009	
Age group							
<14	16,148 (16.1%)	16,021 (15.9%)	16,709 (16.0%)	16,896 (16.1%)	16,883 (16.1%)	8,485 (10.6%)	17.5%
15–24	11,933 (11.9%)	12,110 (12.0%)	12,676 (12.2%)	12,752 (12.1%)	12,764 (12.2%)	9,664 (12.1%)	13.3%
25–44	27,246 (27.2%)	27,124 (26.9%)	27,996 (26.8%)	27,923 (26.6%)	27,720 (26.4%)	19,280 (24.2%)	27.5%
45–64	26,458 (26.4%)	26,930 (26.7%)	27,759 (26.6%)	27,943 (26.6%)	27,941 (26.6%)	24,294 (30.4%)	25.4%
65–74	9,834 (9.8%)	9,810 (9.7%)	10,069 (9.7%)	10,373 (9.9%)	10,471 (10.0%)	9,717 (12.2%)	8.5%
>75	8,593 (8.6%)	8,763 (8.7%)	9,099 (8.7%)	9,078 (8.6%)	9,132 (8.7%)	8,356 (10.5%)	7.8%
Gender							
Female	51,158 (51.0%)	51,461 (51.1%)	53,147 (51.0%)	53,414 (50.9%)	53,346 (50.8%)	40,668 (51.0%)	50.8%
Male	49,054 (49.0%)	49,297 (48.9%)	51,161 (49.0%)	51,551 (49.1%)	51,565 (49.2%)	39,128 (49.0%)	49.2%
Total	**100,212**	**100,758**	**104,308**	**104,965**	**104,911**	**79,796**	**61,792,000**

*Source: Office for National Statistics (2011)

4.4.1 Prevalence

Table 4.2 shows both crude and standardised annual (2009) and five-year prevalence figures for each diagnostic code group. Annual (2009) coding prevalence for generalised pain conditions for the 12 practices included in the CiPCA dataset was between 14 per 10,000 for FM codes only, up to 243 per 10,000 for all generalised musculoskeletal pain codes (including codes for osteoarthritis). Generalised osteoarthritis codes accounted for approximately a quarter of all generalised musculoskeletal pain coding. There was little difference in prevalence between group one (FM codes only) and group two (FM and myofascial pain syndrome codes), reflecting a lack of use of the additional codes included in group two.

There was little difference between the crude and standardised figures for code groups not including osteoarthritis. Those that included osteoarthritis however, showed lower standardised figures. Five-year period prevalence figures for generalised musculoskeletal coding ranged from 34 per 10,000 population for FM codes to 794 per 10,000 for all generalised pain complaints.

Table 4.2 Crude and standardised* annual (2009) and five-year (2005–2009) prevalence figures (per 10,000 population) (95% CI) for diagnostic code groups for all patients consulting 2005 to 2009.

	Annual prevalence (95% CI)		**Five-year prevalence (95% CI)**			
			All patients consulting		Only those fully registered (2005–2009)	
Code Group	Crude	Standardised	Crude	Standardised	Crude	Standardised
Group 1 FM codes only	14 (12, 17)	14 (12, 17)	34 (31, 38)	34 (30, 37)	36 (32, 41)	35 (31, 39)
Group 2 FM and myofascial pain codes	15 (13, 17)	14 (12, 17)	35 (32, 39)	34 (31, 38)	37 (33, 42)	36 (32, 40)
Group 3 Generalised osteoarthritis codes	60 (56, 65)	55 (50, 59)	208 (199, 217)	188 (181, 196)	220 (210, 230)	179 (170, 187)
Group 4 All generalised codes excluding OA	188 (180, 196)	180 (172, 188)	628 (613, 642)	605 (591, 619)	638 (621, 655)	599 (582, 616)
Group 5 All generalised codes	243 (234, 253)	230 (222, 239)	794 (778, 811)	756 (741, 772)	810 (792, 829)	739 (720, 757)

*Standardised to UK general population figures for 2009, source: Office for National Statistics (2011)

There was little difference between five-year prevalence estimates for all patients consulting, and only those fully registered (2005–2009).

4.4.2 Annual variation

Overall there was little annual variation in prevalence of all five code groups between 2005 and 2009 (Table 4.3). Generalised osteoarthritis (group 3) showed a slight decrease from 74 per 10,000 in 2005, to 60 per 10,000 in 2009. For all other generalised pain complaints there was a slight dip in coding between 2005 and 2006 with an otherwise very slight upward trend to 2009. Changes over the five-year period were small – ranging from an increase of one per 10,000 for FM coding (group 1) between 2005 and 2009, to 35 per 10,000 for coding of all generalised pain complaints excluding osteoarthritis (group 4).

Table 4.3 Variation in coding prevalence (per 10,000 population) of non-specific generalised musculoskeletal complaints by code group over time (95% CI) for all patients registered with CiPCA practices.

	Annual prevalence per 10,000 (95% CI)					
	2005	**2006**	**2007**	**2008**	**2009**	**2009:2005 ratio**
Code Group						
Group 1 FM codes only	13 (11, 15)	12 (10, 15)	14 (12, 16)	13 (11, 16)	14 (12, 17)	1.1
Group 2 FM and myofascial pain	13 (11, 15)	12 (10, 15)	14 (12, 16)	13 (11, 16)	15 (13, 17)	1.2
Group 3 Generalised OA	74 (69, 80)	62 (57, 67)	66 (61, 71)	62 (57, 67)	60 (56, 65)	0.8
Group 4 All generalised codes exc. OA	153 (146, 161)	140 (133, 147)	166 (158, 174)	175 (167, 183)	188 (180, 196)	1.2
Group 5 All generalised codes	222 (213, 232)	197 (189, 206)	226 (217, 235)	231 (222, 240)	243 (234, 253)	1.1

exc. OA: excluding osteoarthritis

4.4.3 Practice variation

Coding behaviour varied between practices (Table 4.4). Annual FM (group one codes) coding crude prevalence in 2009 ranged from 3 to 29 per 10,000 depending on practice, and coding of all non-specific generalised pain codes ranged from 159 to 369 per 10,000 depending on practice.

There was little difference between crude and standardised prevalences for each code group across practices.

Table 4.4 Variation in annual coding prevalence (per 10,000 population) (95% CI) for each code group by practice for 2009 (all patients).

	Code Group									
GP	**Group 1** FM codes		**Group 2** FM and myofascial pain		**Group 3** Generalised OA		**Group 4** All generalised pain exc. OA		**Group 5** All generalised pain	
	Crude	Stand.	Crude	Stand.	Crude	Stand.	Crude	Stand.	Crude	Stand.
1	3 (1, 10)	2 (0, 5)	3 (1, 10)	2 (0, 5)	78 (61, 100)	69 (51, 87)	83 (65, 106)	78 (58, 97)	159 (133, 189)	144 (118, 170)
2	29 (20, 43)	32 (19, 45)	32 (22, 46)	34 (21, 47)	41 (29, 57)	49 (32, 65)	138 (115, 165)	150 (123, 177)	174 (148, 204)	193 (162, 225)
3	9 (5, 16)	9 (3, 14)	9 (5, 16)	9 (3, 14)	35 (26, 47)	28 (20, 37)	150 (130, 173)	140 (120, 160)	185 (162, 210)	168 (146, 189)
4	19 (12, 30)	18 (10, 27)	19 (12, 30)	18 (10, 27)	51 (38, 67)	42 (30, 54)	157 (134, 183)	148 (124, 171)	205 (179, 234)	187 (161, 214)
5	14 (8, 22)	14 (7, 21)	14 (9, 23)	15 (8, 23)	48 (37, 62)	50 (37, 63)	167 (145, 191)	174 (149, 198)	209 (185, 236)	218 (191, 245)
6	14 (8, 25)	13 (5, 20)	14 (8, 25)	13 (5, 20)	51 (37, 69)	42 (29, 55)	181 (154, 212)	164 (137, 191)	229 (198, 264)	203 (173, 233)
7	15 (7, 30)	14 (4, 24)	15 (7, 30)	14 (4, 24)	44 (29, 67)	46 (26, 66)	191 (156, 234)	188 (149, 227)	227 (188, 273)	226 (184, 269)
8	29 (19, 43)	29 (17, 41)	29 (19, 43)	29 (17, 41)	70 (54, 92)	65 (47, 82)	223 (192, 259)	223 (189, 257)	290 (254, 330)	284 (246, 322)
9	8 (4, 17)	8 (2, 14)	8 (4, 17)	8 (2, 14)	59 (45, 78)	52 (37, 66)	228 (198, 262)	216 (185, 247)	281 (248, 319)	263 (229, 296)
10	2 (0, 12)	2 (0, 7)	2 (0, 12)	2 (0, 7)	37 (24, 59)	34 (18, 49)	229 (190, 275)	213 (173, 253)	258 (217, 307)	239 (197, 281)
11	11 (6, 19)	11 (4, 17)	11 (6, 19)	11 (4, 17)	90 (74, 110)	82 (65, 98)	243 (215, 274)	234 (205, 263)	328 (296, 364)	311 (278, 344)
12	17 (11, 27)	17 (9, 25)	17 (11, 27)	17 (9, 25)	107 (89, 129)	84 (68, 100)	271 (242, 304)	250 (220, 279)	369 (334, 407)	326 (293, 359)

GP: General practice
OA: osteoarthritis
exc. OA: excluding osteoarthritis
Stand.: standardised to UK general population figures for 2009 (source: Office for National Statistics 2011).

4.4.4 Age and sex variation

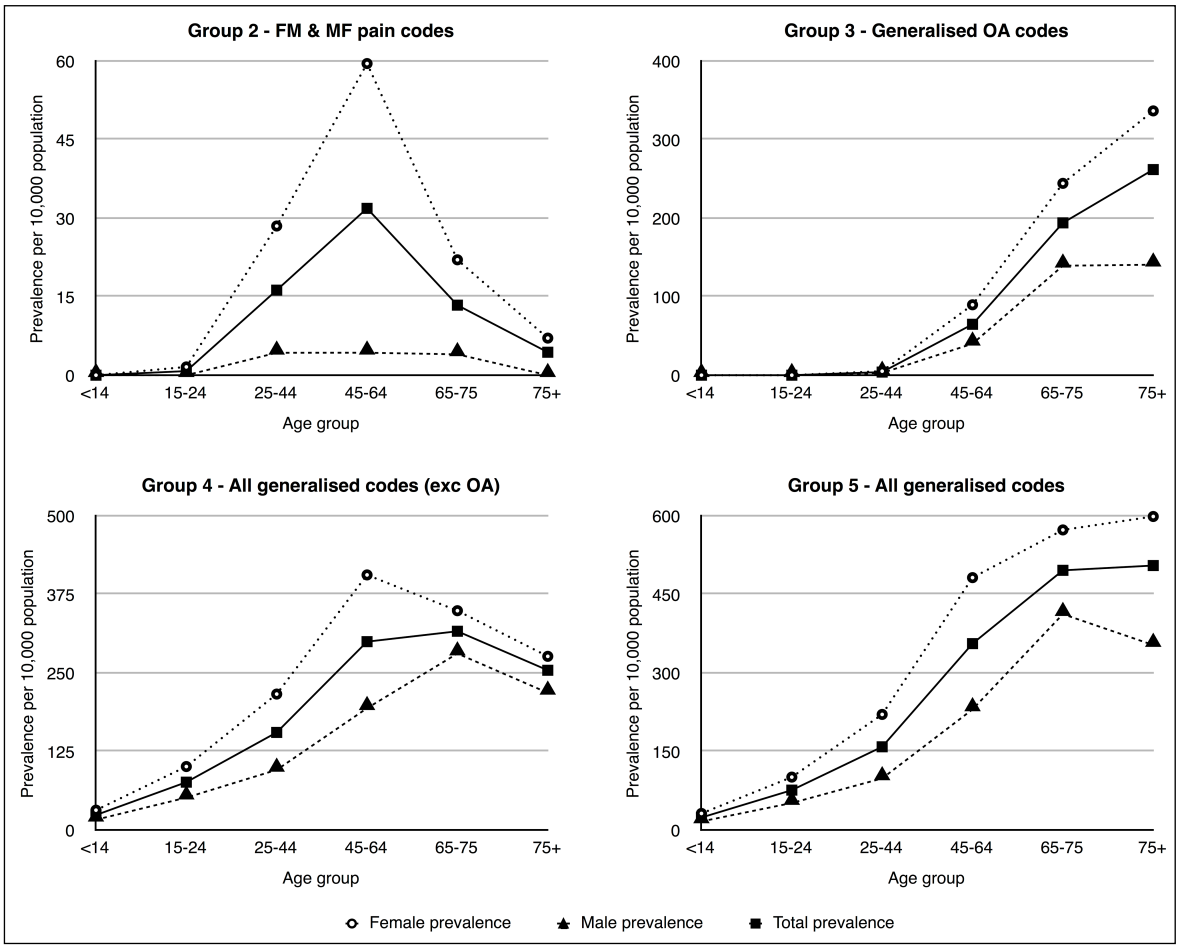
Table 4.5 shows age and gender variation for both annual (for consultations with all CiPCA patients in 2009) and five-year prevalence (for consultations with patients fully registered with the CiPCA practices 2005–2009) for all five code groups. Variation in annual prevalence by age and gender is illustrated in Figure 4.1. For clarity, and owing to little variation between groups one (FM codes only) and two (FM and myofascial pain codes), only group two is shown on the graph in Figure 4.1.

Table 4.5 Annual (2009) and five-year prevalence (2005–2009, fully registered patients only) (per 10,000 population) by age and gender.

Code Grp	Age Grp	Annual prevalence (2009)			Five-year prevalence (fully registered 2005–2009)		
		Female	Male	Total	Female	Male	Total
1	<14	0 (0, 4)	0 (0, 2)	0 (0, 5)	0 (0, 9)	2 (1, 8)	1 (0, 12)
	15–24	2 (0, 9)	0 (0, 3)	1 (0, 8)	13 (6, 27)	0 (0, 4)	6 (2, 19)
	25–44	28 (20, 38)	4 (2, 8)	16 (10, 24)	75 (60, 94)	9 (6, 15)	42 (31, 57)
	45–64	59 (47, 73)	4 (2, 7)	31 (23, 42)	121 (103, 142)	17 (12, 23)	69 (56, 85)
	65–75	22 (12, 39)	4 (2, 10)	13 (7, 27)	45 (30, 69)	9 (4, 17)	28 (17, 47)
	75+	7 (2, 23)	0 (0, 4)	4 (1, 14)	12 (5, 31)	3 (1, 10)	8 (3, 21)
	Total	**26 (22, 30)**	**3 (2, 4)**	**14 (12, 17)**	**63 (55, 71)**	**9 (7, 11)**	**36 (32, 41)**
2	<14	0 (0, 4)	0 (0, 2)	0 (0, 5)	0 (0, 9)	2 (1, 8)	1 (0, 12)
	15–24	2 (0, 9)	0 (0, 3)	1 (0, 8)	13 (6, 27)	0 (0, 4)	6 (2, 19)
	25–44	28 (21, 39)	4 (2, 8)	16 (11, 25)	75 (60, 94)	9 (6, 15)	42 (31, 57)
	45–64	59 (48, 74)	4 (2, 7)	32 (24, 43)	124 (106, 146)	17 (13, 23)	71 (58, 88)
	65–75	22 (12, 39)	4 (2, 10)	13 (7, 27)	47 (31, 72)	9 (4, 17)	29 (17, 48)
	75+	7 (2, 23)	0 (0, 4)	4 (1, 14)	12 (5, 31)	3 (1, 10)	8 (3, 21)
	Total	**26 (22, 31)**	**3 (2, 4)**	**15 (13, 17)**	**64 (57, 72)**	**9 (7, 12)**	**37 (33, 42)**
3	<14	0 (0, 4)	0 (0, 2)	0 (0, 5)	0 (0, 9)	0 (0, 5)	0 (0, 9)
	15–24	0 (0, 6)	0 (0, 3)	0 (0, 6)	0 (0, 8)	0 (0, 4)	0 (0, 8)
	25–44	5 (2, 10)	3 (1, 6)	4 (2, 9)	20 (13, 31)	8 (5, 13)	14 (8, 24)
	45–64	90 (75, 107)	40 (33, 48)	65 (53, 80)	332 (302, 366)	158 (143, 175)	246 (220, 275)
	65–75	244 (205, 291)	139 (119, 164)	194 (160, 234)	785 (711, 866)	362 (326, 401)	582 (521, 650)
	75+	336 (281, 402)	141 (118, 167)	262 (223, 307)	852 (762, 953)	408 (367, 452)	677 (611, 750)
	Total	**85 (78, 94)**	**35 (31, 38)**	**60 (56, 65)**	**309 (292, 326)**	**128 (120, 136)**	**220 (210, 230)**
4	<14	31 (22, 46)	16 (11, 24)	24 (15, 37)	163 (130, 205)	132 (110, 159)	147 (115, 189)
	15–24	101 (79, 128)	51 (40, 65)	76 (57, 101)	357 (309, 412)	190 (165, 220)	270 (227, 321)
	25–44	216 (193, 242)	96 (85, 108)	155 (136, 177)	731 (680, 784)	381 (355, 409)	555 (511, 603)
	45–64	406 (374, 440)	194 (178, 211)	300 (273, 329)	1,171 (1,115, 1,230)	609 (579, 639)	892 (842, 943)
	65–75	349 (302, 403)	281 (251, 314)	316 (273, 366)	1,094 (1,008, 1,187)	704 (655, 756)	908 (832, 990)
	75+	276 (227, 336)	218 (190, 250)	254 (216, 298)	811 (722, 909)	529 (483, 579)	700 (633, 774)
	Total	**243 (230, 257)**	**130 (123, 137)**	**188 (180, 196)**	**819 (792, 846)**	**450 (436, 464)**	**638 (621, 655)**
5	<14	31 (22, 46)	16 (11, 24)	24 (15, 37)	163 (130, 205)	132 (110, 159)	147 (115, 189)
	15–24	101 (79, 128)	51 (40, 65)	76 (57, 101)	357 (309, 412)	190 (165, 220)	270 (227, 321)
	25–44	221 (198, 246)	98 (87, 111)	159 (139, 181)	746 (696, 800)	387 (360, 415)	565 (521, 613)
	45–64	482 (447, 518)	230 (213, 248)	356 (326, 388)	1,424 (1,363, 1,487)	741 (709, 775)	1,085 (1,031, 1,141)
	65–75	573 (512, 640)	412 (376, 452)	496 (441, 557)	1,690 (1,585, 1,800)	986 (928, 1,047)	1,353 (1,262, 1,450)
	75+	598 (524, 682)	353 (317, 393)	505 (451, 565)	1,489 (1,372, 1,615)	867 (809, 929)	1,245 (1,157, 1,338)
	Total	**321 (306, 337)**	**162 (155, 170)**	**243 (234, 253)**	**1,057 (1,027, 1,088)**	**554 (538, 570)**	**810 (792, 829)**

Grp: Group
Code groups: 1: FM; 2. FM and myofascial pain; 3. Generalised osteoarthritis; 4. All non-specific generalised pain codes excluding osteoarthritis; 5. All non-specific generalised pain codes.

Figure 4.1 Variation in annual prevalence (per 10,000) by age & gender for code groups 2–5 in 2009.



NB: Y-axis scale varies.
MF: Myofascial pain; OA: osteoarthritis.

For all code groups there is an increased prevalence in women (see Table 4.6). The gender disparity is most marked in code groups one and two (FM and myofascial pain codes). For the code groups that exclude osteoarthritis codes (one, two, and four) there is a peak in women in the 45–64 age group. For the code groups that include osteoarthritis (groups three and five) there is an increase in prevalence with age. Five-year prevalence figures for fully registered (2005–2009) patients are higher than annual prevalence figures, but show similar age and gender trends.

Table 4.6 Male:female ratio for annual (2009, all patients) and five-year prevalence (2005–2009, fully registered patients only) for all five code groups.

	Male:female ratio	
Code Group	Annual (2009)	Five-year fully registered (2005–2009)
Group 1 FM codes only	0.12	0.14
Group 2 FM and myofascial pain codes	0.12	0.14
Group 3 Generalised osteoarthritis codes	0.41	0.41
Group 4 All generalised codes excluding OA	0.53	0.55
Group 5 All generalised codes	0.50	0.52

OA: osteoarthritis.

4.4.5 Comparison with general population prevalence estimates

We estimated annual FM coding prevalence at 14 per 10,000 (95% CI: 12, 17); other estimates for medical record and health insurance coded FM prevalence have ranged from 18 to 45 per 10,000 (see section 3.4.5.b). One study (Hughes et al. 2006) calculated five-year FM coding prevalence in a large UK primary care consultation dataset (GPRD, General Practice Research Database[39]) at 18 per 10,000, which is lower than our estimate for five-year prevalence (34 per 10,000), but comparable to the annual coding prevalence of 14 per 10,000 that we calculated.

Annual and five-year coding prevalence for all five groups of codes (14 to 819 per 10,000) was lower than community CWP pain prevalence estimates (1,077 per 10,000, from meta-analysis in Chapter Three). The annual coding prevalence of FM (14/10,000, 95% CI: 12, 17) calculated for the CiPCA practices was 8% of the pooled community point prevalence (180/10,000, 95% CI: 150, 200) calculated in the meta-analysis presented in the previous chapter. The annual coding prevalence of all non-specific generalised pain codes related to CWP (243/10,000, 95% CI: 234, 253) was 23% of the pooled community point prevalence of CWP (1,077 per 10,000, 95% CI: 907, 1,249).

[39] Now known as the Clinical Practice Research Database; http://www.cprd.com/intro.asp.

4.5 Discussion

Annual recorded prevalence of non-specific generalised pain complaints related to CWP ranged from 14 to 243 per 10,000, depending on code group. Coded prevalence of FM was comparable to figures from another UK primary care study (Hughes et al. 2006). Overall, there was little variation in coding prevalence over time, but coding behaviour varied between practices. Prevalence was higher in women for all code groups. Prevalence of FM coding peaked in middle age and then declined, prevalence for generalised osteoarthritis and all non-specific generalised pain codes including osteoarthritis increased with increasing age, and prevalence of all non-specific pain codes excluding osteoarthritis showed an initial upward trend with age with a peak at middle age.

4.5.1 Prevalence

We need to be aware when we compare *period* coding prevalence figures with *point* community prevalence estimates (from the systematic review), that period and point prevalence are unlikely to be equivalent. Research demonstrates that CWP prevalence is stable over time (Croft et al. 1993, Hunt et al. 1999, McBeth et al. 2001a, Aggarwal et al. 2006) but for half of CWP cases symptoms resolve within a year (McBeth et al. 2001a). This suggests a dynamic picture with equal numbers of new and resolving cases over the course of a year giving a stable point prevalence. Since period prevalence based on a single consultation during that period will encompass all those with symptoms during the specified timeframe (including new cases, those with continuous symptoms, and those whose symptoms have resolved) period prevalence is likely to over-estimate point prevalence.

Annual coding figures will represent the number of people recognised with a generalised condition in a year. Five-year period prevalence figures should pickup most people in a practice with the condition who consult for their symptoms during that period (and are recognised as having a generalised condition), but not all will still have the condition at the end of the five-year period. Five-year figures are therefore even more likely than annual figures to over-estimate point community prevalence. This is consistent with the observation from this study that five-year coding prevalence was higher than annual coding prevalence for both FM and ‘recognised’ CWP (i.e. coding of all non-specific generalised pain codes related to CWP). However, neither annual nor

five-year period coding prevalence can be robustly compared to general population point prevalence estimates (from the systematic review), but, if we keep in mind the caveats discussed above we can draw some useful conclusions regarding how much CWP/FM might be recognised in primary care.

For FM, both annual (14 per 10,000) and five-year (34 per 10,000) estimates were lower than point estimates for general population (180 per 10,000). Annual FM coding prevalence was 8% of general population prevalence, and five-year FM coding prevalence was 28% of general population prevalence. Not all those with FM will consult for their symptoms, but, given that FM/CWP has been associated with help-seeking behaviour (section 2.2.5) it seems reasonable to suggest that more than a third of those with FM will consult their GP for their symptoms. Further, given that we would expect period prevalence to over-estimate point prevalence this suggests FM is under-recorded and possibly under-recognised in primary care.

Given a CWP community point prevalence of 11% (Chapter Three) of whom an estimated 72% have consulted for their pain at any time (Macfarlane et al. 1999), we might expect an annual CWP consultation prevalence of around 8%. In fact the annual prevalence for all non-specific generalised pain (including osteoarthritis) was 2.4% (243/10,000). The five-year prevalence was 8%, but not everyone recorded over five years with a non-specific generalised pain code would still report CWP up to five years later, so we would expect the five-year prevalence to be higher. Moreover, including generalised osteoarthritis codes means not all those identified will fulfil CWP criteria. While some generalised osteoarthritis coding could be a label given to CWP in older patients, the majority should reflect appropriate osteoarthritis diagnoses and not fulfil CWP criteria, therefore, recording of all non-specific generalised pain codes (including osteoarthritis codes) is likely to over-estimate 'recognised' CWP. True recognised CWP coding prevalence is likely to be closer to the lower prevalence estimate for non-specific pain excluding osteoarthritis (annual prevalence 1.9%, five-year prevalence 6.4%). Consequently, we can argue that our results suggest that both FM and CWP are under-recognised in primary care.

The under-recording of FM in primary care is consistent with what we might expect given the contention surrounding FM as valid diagnoses (section 2.2.3), the lack of awareness of the FM diagnosis by clinicians (section 2.2.3), the evidence suggesting that coding is not a neutral

activity (de Lusignan et al. 2003), the evidence that many musculoskeletal complaints are not coded (Salisbury et al. 2013), and that coding of conditions with subjective case definitions is variable (Jordan et al. 2004).

Figures for FM annual coding prevalence from the CiPCA dataset were comparable with those established from a large, quality controlled, database of UK primary care medical records (Hughes et al. 2006). This suggests that the findings in this thesis, established using the CiPCA dataset, are generalisable to the rest of the UK population. However, the prevalence estimates from the GPRD (General Practice Research Database) are five-year period prevalence figures and are much lower than the five-year prevalence estimates calculated in this study.

We saw very little difference in prevalence when comparing coding prevalence of two specific FM codes (group one) with eight codes for FM and myofascial pain syndrome (group two), suggesting that the extra six codes were rarely used. This is consistent with the findings of Hughes et al. (2006), who noted a preferential use of some codes over others. Out of 2,260 new FM diagnoses, 2,257 were labelled with 'fibromyalgia' (Read codes N248 and N239), and only three were labelled 'fibromyalgia not otherwise specified' (Read code N2412).

There was little difference between crude and standardised figures for code groups not including osteoarthritis. However, for code groups including osteoarthritis, standardised figures were lower than crude estimates. This reflects the older population covered by the CiPCA dataset and the increased prevalence of osteoarthritis in older age groups.

4.5.2 Annual variation

Our results demonstrated very little annual variation in coding between 2005 and 2009 across all five groups of generalised pain codes. This suggests that coding practices for the groups of codes studied are reasonably static. This contrasts with findings from an earlier study (Gallagher et al. 204) using the GPRD which indicated a trend for increased FM coding between 1990 and 2001.

4.5.3 Practice variation

Consistent with research suggesting heterogeneity in coding practices (Gray et al. 2003, Hobbs and Hawker 1995, Tai et al. 2007), we saw differences in coding prevalence between practices. This suggests that, to account for differences in coding behaviour, when using routinely recorded clinical data to identify cases we need to use a broad and inclusive range of morbidity codes. This is of relevance to this thesis if we consider that the original RRC criteria were developed in only one practice using a list of 147 Read codes for regional musculoskeletal problems. There are over 5,000 musculoskeletal Read codes and 4,482 of these represent regional musculoskeletal problems.

4.5.4 Age and sex variation

As would be predicted by general population figures (section 3.4.5.d) both FM-related codes and osteoarthritis codes are either not used or have very limited usage in the lower age groups.

Studies have shown FM to largely affect those in middle age (section 3.4.5.d), so it is not surprising to see a peak of FM coding in the 45–64 year age group. Examining the generalised osteoarthritis codes only, as would be expected with a degenerative condition, there is a clear increase in prevalence with increasing age, which is reflected in the higher prevalence for the group five codes (all generalised codes including osteoarthritis).

The age distributions observed for those recorded with all generalised pain codes, both including and excluding osteoarthritis (groups 4 and 5), demonstrate similar patterns to those observed in studies of general population CWP prevalence – either a peak in middle age or increase in older ages (section 3.4.5.d). This suggests that these codes lists are identifying individuals who have a similar age profile to patients with self-reported CWP.

For all code groups prevalence was higher in women. This is consistent with general population findings for CWP from the systematic review (section 3.4.5.c). Further, in the systematic review we noted a more marked difference between genders in FM than in CWP. This is mirrored in our findings here, where there was a more marked disparity between genders in those recorded with FM codes (group one) than those recorded with all generalised pain codes (groups four and five).

4.5.5 Future application

This chapter has developed a list of Read codes that could be used to represent 'recognised' CWP in primary care. The overlap of recognised CWP (coding of non-specific generalised pain codes) with unrecognised CWP coding (represented by Rohrbeck's RRC criteria) will be explored in the next chapter (section 5.4.6.a), and in Chapter Six the features of recognised CWP (section 6.3.3) and the combined coding prevalence of recognised and unrecognised CWP (section 6.3.4) will be explored in further detail.

4.5.6 Strengths and limitations

a. Study population

While generalisability may be reduced by the geographical limitation of the CiPCA study to one area of the UK (North Staffordshire), the CiPCA database has been demonstrated to give similar musculoskeletal consultation prevalence figures to a larger national general practice database (Jordan et al. 2007) and international databases (Jordan et al. 2013). Moreover, compared to the UK general population, the CiPCA population was comparable on gender distribution. However, the study population was demonstrated to have a higher percentage of older people than the UK general population. To account for this we standardised annual and five-year prevalence estimates to UK general population figures. In addition, the systematic review did not show great geographical variation accross Europe in CWP prevalence, so restricting the study geographically may only have a small influence on the ability to transfer the results to other populations.

b. Variation by age and gender

It is important to note that observed variations in prevalence by age, gender, and practice may reflect different clinicians coding practices rather than genuine population variation. However, variation in prevalence by age and gender for the codes investigated in the chapter appear to mirror the age and gender distribution of CWP in the general population observed in the previous chapter.

c. Read codes

Read codes for non-specific generalised pain complaints with the potential to be used to record consultations with CWP patients were identified from a list of 'site unspecified' codes identified in a previous study (Jordan et al. 2010). Identification of musculoskeletal codes was undertaken by

two GPs independently and a team of four GPs then allocated each code to an individual body region. Generalised pain codes and ambiguous codes with the potential to represent either regional or generalised pain (e.g. arthralgia, rheumatic pain) were then identified from the list of 'site unspecified' codes. This process was unlikely to have missed any relevant codes.

Codes selected for inclusion in the study were then established from this list after consultation (in a series of mainly one-to-one interviews) with an advisory panel of six GPs and a rheumatologist. All agreed on the codes unlikely to be used for CWP and these were therefore excluded from the list of codes used in the study. However, this was a limited and select group of clinicians. Only seven clinicians were approached. All seven clinicians had an interest in research. Two had a specialist musculoskeletal research interest, and consequently their opinions regarding coding practices may reflect how they hope these conditions are coded rather than how they are coded. Five of the panel were from the North Staffordshire GP Research Network. The Research Network was established in 1997 by the Primary Care Research Centre at Keele University (Porcheret et al. 2004). Practices with previous audit participation, particularly using electronic data, were approached for inclusion in the network. Prior research involvement using electronic data by the five GPs from the research network might suggest an enhanced Read code literacy and a greater value on accurate coding practices. In addition, the one-to-one interview format may have compelled the clinicians to provide what they felt to be correct answers, rather than providing a more accurate picture of their coding practices. However, in seeking to identify 'recognised CWP', by identifying codes that might be used to record consultations for idiopathic pain syndromes, it would seem both reasonable and medically sound to follow the advice of the clinicians who apply those codes in practice and exclude conditions with: i) clearly identified underlying pathology; ii) injury or trauma; iii) vertebral conditions with myelopathy; iv) structural problems (e.g. fracture); and v) strains or sprains.

d. Inclusion of generalised osteoarthritis codes

Osteoarthritis is an 'active repair process that takes place in all joint tissues and involves localised loss of cartilage and remodelling of adjacent bone' (National Institute for Health and Care Excellence 2008, p.1). It could be argued therefore that, given recommendations by the advisory panel to exclude conditions with clearly identified pathology, generalised osteoarthritis codes should not have been included on the list of codes with the potential to represent CWP. However,

research (Graven-Nielsen et al. 2012) suggests that there is a subgroup of osteoarthritis patients with abnormalities of pain processing consistent with central sensitisation, which is one of the theories proposed to explain the pathophysiology of FM (Clauw and Crofford 2003). In addition it is possible that a clinical label of osteoarthritis may be given to older patients presenting with musculoskeletal pain who might better fit a CWP/FM diagnosis. To counter concerns about including osteoarthritis codes we presented figures both for generalised osteoarthritis alone (group 3), and for all non-specific generalised pain codes both including (group 5) and excluding (group 4) osteoarthritis codes.

e. Exclusion of coded hospital consultations

It could be argued that coded hospital consultations should have been included in order to better establish the burden of CWP in primary care. However, the aim was to establish how much CWP is recognised in primary care, not as a secondary care diagnosis. Coded hospital consultations were therefore excluded.

4.6 Conclusions

Age and gender patterns for individuals recorded with non-specific generalised pain codes were similar to those seen in CWP in the general population. Comparison of coding prevalence figures for non-specific generalised pain codes (recognised CWP) with general population prevalence of CWP reveal some disparity between community burden and CWP recording in primary care, particularly regarding recent (annual) consultation. The results of this study therefore suggest an under-recording of CWP in primary care which implies that CWP consulters may not all be recognised as having a generalised condition. The next chapter will consequently start to assess an approach to identifying these potentially unrecognised CWP patients.

Chapter 5
Code list development

5.1 Introduction

In the previous two chapters we postulated that, given there is no primary care morbidity code for CWP, GPs might be recording patients presenting with CWP with a non-specific generalised pain complaint. However, there was a marked disparity between the number of CWP patients expected to consult (estimated at approximately 8% of the population: calculated as 72% (Macfarlane et al. 1999) of the community CWP prevalence of 11%, estimated in Chapter Three) and the observed annual consultation prevalence of non-specific pain complaints (2.4%, section 4.4.1). The question arising from this disparity is: if only a small proportion of the CWP consulters are recorded with generalised pain conditions, what codes are being recorded for consultations by the remaining CWP patients?

As suggested earlier, one hypothesis is that GPs record and therefore treat individual regional pain complaints (e.g. hip or elbow pain) rather than the underlying CWP (Rohrbeck 2002). Based on this hypothesis, Rohrbeck used primary care consultation patterns to identify a set of patients with repeated consultations for pain in different body regions. Patients fulfilling the recurrent regional consulting (RRC) criteria had more health problems, worse self-reported general health, more sleep problems, and more fatigue (Rohrbeck et al 2007). These features have also been observed in CWP/FM patients (Hunt et al. 1999, Aggarwal et al. 2006), suggesting that the RRC criteria successfully identified CWP patients from their regional pain consultation patterns. Further, in a study using primary care consultation data, Jordan et al. (2010) found that the coding prevalence of patients consulting for a musculoskeletal complaint over one year in more than one body region was nearly 6%. The RRCs identified by Rohrbeck might therefore go some way to explaining the observed gap between estimated CWP consulting prevalence and recorded CWP prevalence (non-specific generalised pain coding); that is, identifying patients with CWP currently unrecognised in primary care.

The Rohrbeck-2007 RRC criteria used a list of 147 musculoskeletal pain morbidity codes developed through analysis of the medical records of one general practice. There are nearly

6,000 musculoskeletal Read codes (Jordan et al. 2010) and recognised variation in morbidity recording between practices (section 2.3.1). The first aim of this chapter was therefore to develop further the list of codes used to define RRCs to allow the RRC definition to be implemented outside the original practice in which it was developed, prior to further validation of the definition. Alternative code sets were tested within the established RRC criteria to decide which code list should be taken into the next stage of development.

Two code lists were tested in addition to Rohrbeck et al's (2007) original limited code list. The first code list comprised all regional musculoskeletal morbidity codes. The second excluded from the list of all regional codes any identified by clinicians on an advisory panel as unlikely to represent CWP.

The second aim was to assess whether the application of the RRC criteria returned a patient group who fitted the construct of CWP. Cases fulfilling the criteria were compared to a control group on prevalence, age and sex distribution, comorbidity, recorded somatic symptoms, alternative diagnoses (rheumatoid arthritis, systemic lupus erythematosus, etc), and frequent attendance. The degree of overlap of RRCs with those recorded with generalised pain conditions was also explored.

5.2 Aims and objectives

The overall aim of this chapter was to test candidate sets of regional musculoskeletal Read codes with the existing RRC consultation pattern definition (Rohrbeck-2007 criteria) in primary care consultation data, and to assess whether patients returned by the Rohrbeck criteria appeared to fit with the known characteristics of CWP.

Specifically:

1. To apply the Rohrbeck-2007 criteria for recurrent regional musculoskeletal consulters (RRC) using the following three code lists:
    A. Rohrbeck (2007) original short code list (RRC-Rohrbeck)
    B. All regional musculoskeletal codes (RRC-all)
    C. The codes in B) having excluded all those codes identified by clinicians as being unlikely to represent CWP (RRC-clinician).
2. To explore similarities and differences in age and gender distribution, prevalence, number of recorded somatic symptoms, comorbidity, levels of frequent attendance, and degree of overlap with non-specific generalised pain recording, between RRCs returned using the three alternative code sets.
3. Establish how much 'unrecognised' CWP the RRC definition identifies by exploring the overlap between recurrent regional pain consultation (RRC) and recorded non-specific generalised pain consultation ('recognised' CWP e.g. FM).

4. To establish the construct validity of the RRC definition as a measure of CWP in primary care using each of the code lists by investigating the following hypotheses:
    4.1. The consulting prevalence of RRCs approximates the estimated consultation prevalence of CWP (8%).
    4.2. The age and gender distributions of RRCs more closely resembles those expected from patients with CWP than those of a control group who consult only for single-site musculoskeletal problems. Specifically, cases are hypothesised to be older and with a higher female proportion than controls.
    4.3. Comorbidity is higher in RRCs than in controls.
    4.4. The number of somatic symptoms in RRCs is higher than in controls.
    4.5. The percentage of RRCs who are frequent attenders is higher than for controls.
    4.6. The percentage of frequent attenders who are also RRCs is consistent with that expected from patients with CWP (20–30% of frequent attenders have medically unexplained symptoms (Karlsson et al. 1997, Jyväsjärvi et al. 2001, Reid et al. 2001b, Smits et al. 2009); CWP is a subset of medically unexplained symptoms, therefore, less than 30% of frequent attenders should fulfil CWP criteria).
    4.7. The percentage of patients recorded with differential diagnoses for FM/CWP (e.g. rheumatoid arthritis, systemic lupus erythematosus) is similar for cases and controls.

5.3 Methods

Overarching aims addressed throughout:

1. To apply the Rohrbeck-2007 criteria for recurrent regional musculoskeletal consulters (RRC) using the following three code lists: A. Rohrbeck (2007) original short code list (RRC-Rohrbeck); B. All regional musculoskeletal codes (RRC-all); and C. excluding from B) all those codes identified by clinicians as being unlikely to represent CWP (RRC-clinician).
2. To explore similarities and differences in age and gender distribution, prevalence, number of recorded somatic symptoms, comorbidity, levels of frequent attendance, and degree of overlap with non-specific generalised pain recording, between RRCs returned using the three alternative code sets.

5.3.1 Cases and controls

Cases and controls were identified from all patients (no age restriction) fully registered with the 12 primary care practices in the CiPCA dataset between the years 2005 and 2009.

Three non-mutually exclusive groups of cases were identified using the RRC criteria (see Table 5.1) with three code lists (illustrated in Figure 5.1):

A. Rohrbeck (2007) original short code list (RRC-Rohrbeck)

B. All regional musculoskeletal codes (RRC-all)

C. The codes in B) having excluded all those codes identified by clinicians as being unlikely to represent CWP (RRC-clinician).

Table 5.1 Rohrbeck RRC definition (2007).

In a period of 5 consecutive years fulfil all of i)–iv): i) at least 1 consultation for a musculoskeletal complaint in the axial skeleton (neck & back); ii) at least 1 consultation for an upper or lower limb complaint; iii) at least 1 consultation for a regional musculoskeletal complaint in each of 3 separate years; iv) at least 4 consultations for regional musculoskeletal complaints in total during the 5 year period.

Controls were patients with musculoskeletal consultations in only one of the three regions defined in the RRC criteria (axial, upper limb or lower limb) over the five-year period between 2005 and 2009.

Cases and controls were compared on: five-year prevalence (using patients fully registered between 2005 and 2009 as denominator), age and sex distribution, number of somatic symptoms, all-cause morbidity, frequent attendance, and the proportion of patients with alternative diagnoses (e.g. rheumatoid arthritis, systemic lupus erythematosus). We also calculated the proportion of RRCs with recorded generalised conditions (e.g. FM, generalised osteoarthritis).

Ambiguous codes that may reflect either regional or generalised problems, for example, codes simply labeled ‘arthralgia’ or ‘joint pain’ with no region specified, were excluded from code lists B (all regional musculoskeletal codes) and C (clinician defined regional musculoskeletal codes). This research aimed to identify a subset of CWP consulters who are unrecognised as having a generalised pain condition; ambiguous codes were excluded to ensure that RRC criteria identified patients on the basis of their consultation patterns for regional (not generalised) complaints only.

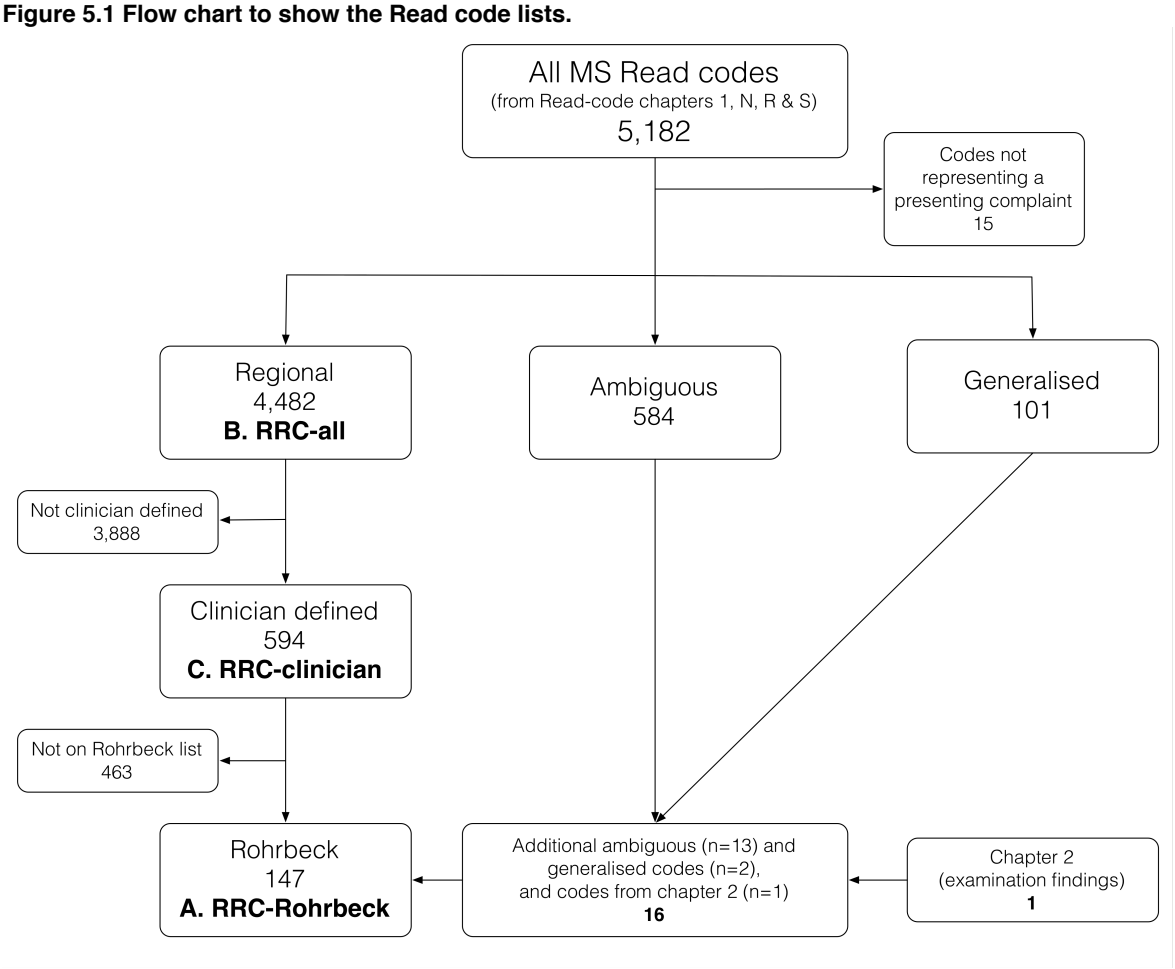
Codes that represent musculoskeletal complaints are located across four Read code chapters: Chapter 1 – History/Symptoms; Chapter N – Musculoskeletal/connective tissue diseases; Chapter R – Symptoms, signs and ill-defined conditions; and Chapter S – Injury and poisoning.

In a previous study (Jordan et al. 2010), two research GPs independently identified 5,182 unique Read codes (representing 5,908 clinical terms) from Chapters 1, N, R, and S as being musculoskeletal in nature. A team of four GPs then allocated each musculoskeletal code to an individual body region (e.g. hand, knee, back) where possible.

We assigned the musculoskeletal Read codes identified by the Jordan et al. (2010) study to one of three categories: regional, generalised, or ambiguous (Figure 5.1):

1. *Regional musculoskeletal complaints*: Includes all codes assigned to individual body regions and regional musculoskeletal complaints where a site is not specified (e.g. N23y4: Spasm of muscle).
2. *Generalised musculoskeletal complaints:* Includes codes with clinical terms that include the words ‘generalised’ or ‘multiple site’, or codes for conditions that are widespread by definition (e.g. FM).
3. *Ambiguous clinical terms:* Broad clinical terms for musculoskeletal problems; includes site unspecified codes that could represent either regional or generalised conditions. These codes tend to be non-specific, inclusive terms such as ‘musculoskeletal diseases’ or ‘joint disorders’.

Figure 5.1 Flow chart to show the Read code lists.



MS: Musculoskeletal

a. Rohrbeck (2007) original short code list - RRC-Rohrbeck

The original code list developed by Rohrbeck consists of 147 codes, including 132 regional musculoskeletal codes (including code one code from Chapter 2 – examination findings), 13 ambiguous codes, and two generalised codes (see appendix A5.1: Tables A5.1 and A5.2). Twenty-eight represented axial complaints (including two classified as both axial and lower extremity complaints), 42 represented lower extremity complaints (including two classified as both axial and lower extremity complaints), and 64 upper extremity codes (see appendix 5.1 for code list and Figure 5.1). The remaining codes, whether regional, generalised, or ambiguous, were counted as 'regional' complaints when used with the Rohrbeck-RRC definition, i.e. used only for criteria iii) and iv) (see Table 5.1) (see appendix A5.1, Table A5.2 for the regional or ambiguous codes included on Rohrbeck's original code list). The regional musculoskeletal codes on the Rohrbeck list includes one code (2H23: on examination painful arc) from Read code Chapter 2 (codes relating to clinical examination findings). No Chapter 2 codes were included in code lists B or C.

b. All regional musculoskeletal codes - RRC-all

The list of all regional musculoskeletal complaints was used to identify the RRC-all group of codes. Using the body regions defined by Jordan et al. (2010), regional complaints with a specified site were assigned to the following three categories: axial, upper limb or lower limb. The body regions allocated to each category are listed below:

1. *Axial:* includes codes allocated to the following regions: back, chest, neck, head/neck, lower back and lower limb, lower back and pelvis/lower limb, neck, neck and back, neck and trunk, neck and upper back, neck and upper limb, trunk and pelvis, and upper back. Abdominal codes were excluded from this category as the ACR-90 criteria define axial pain as being located in the cervical spine, anterior chest, thoracic spine, or low back. Codes allocated to the 'pelvis' region were evaluated individually and categorised as being either axial (sacral, sacroiliac, or coccygeal complaints) or appendicular (complaints not specifying sacral, coccygeal, or sacroiliac region). Axial pelvic codes were included in this category.

2. *Upper limb:* includes codes allocated to the following regions: elbow, forearm, hand, neck and upper limb, shoulder girdle, shoulder girdle/upper arm, shoulder girdle/upper limb, shoulder girdle/upper limb, shoulder, upper limb, upper arm, wrist, wrist/hand.

3. *Lower limb*: includes codes allocated to the following regions: ankle, ankle/foot, buttock, foot, hip, hip/thigh, knee, lower back and lower limb, lower back and pelvis/lower limb, lower leg, lower limb, pelvis/hip, pelvis/thigh, thigh, trunk and pelvis. Codes allocated to the 'pelvis' region were evaluated individually and categorised as being axial (sacral, sacroiliac, or coccygeal complaints) or appendicular (complaints not specifying sacral, sacroiliac, or coccygeal region). Pelvic codes identifying sacral, coccygeal or sacroiliac complaints were excluded from this category; all other pelvic codes were included.

Where a code for a regional complaint was identified as both an axial and a limb complaint (for example acute back pain and sciatica), it was assigned to both categories, as pain was determined to be simultaneously present in both body regions. Codes associated with multiple clinical terms located in conflicting regions (for example code N245 is associated with 17 separate terms located in both upper and lower extremity) were assigned to categories individually on the basis of the associated clinical term used in the consultation data. Codes with

no specified site were recorded as regional complaints only and contributed only to criteria iii) and iv) of the Rohrbeck definition (Table 5.1).

Of the list of 5,182 unique codes, 4,482 were identified as regional musculoskeletal problems, 101 as generalised problems, and 584 as ambiguous (see Figure 5.1). The remaining 15 codes did not represent consultations for current problems; they included terms such as 'at risk of,' or 'family history of.' The 4,482 codes representing regional musculoskeletal problems were used to identify the RRC-all group. There were 1,040 axial codes, 1,509 lower extremity codes,1,638 upper extremity codes, and 308 regional codes with no site specified[40] (see appendix 5.2 for code list).

c. Clinician defined code list - RRC-clinician

The codes to be excluded from the list of all regional musculoskeletal codes (to generate code list C) were established after consultation with an advisory panel of six GPs and a rheumatologist (see also section 4.3.2). Two of the panel had specialist musculoskeletal research interests and worked both clinically and within the Arthritis Research UK Primary Care Research Centre at Keele University. The remaining five clinicians were members of the North Staffordshire GP Research Network (Porcheret et al. 2004) with no special musculoskeletal interest.

All the clinicians were approached for their advice regarding coding practices for consultations with patients who present to their GPs with symptoms of CWP. In a series of mainly one-to-one sessions (with KM), the GPs discussed how they would routinely code consultations with patients who present with medically-unexplained musculoskeletal pains.

Across the seven panel members there was no consistent approach to the coding of CWP patients. Of the five GPs from the North Staffordshire GP Research Network (i.e. non musculoskeletal specialists external to the Arthritis UK Primary Care Centre, Keele University), four expressed a reluctance to give precise diagnostic codes to patients without a secondary care diagnosis, some sort of clear investigative evidence, or strong clinical indication (relating to any condition not just FM or CWP). There seemed to be very much a 'watch and wait' policy, with caution about the implications of diagnostic labels. Most preferred to use a looser description of a 'reason for attendance' rather than a 'diagnosis' for patients who could potentially meet accepted

[40] Please note that these numbers will not sum to the total 4,482 regional codes as some codes are simultaneously classified as both limb and axial (e.g. acute back pain and sciatica).

criteria for CWP, citing the wider implications of labelling and the need to exclude self-limiting conditions before assigning a diagnostic label. The remaining GP was much more confident to assign labels, largely because he seemed more positive about what this could offer a patient.

As highlighted in section 4.3.2, while there was a diversity of coding practices in use among the panel members, there was a clear consensus regarding what codes would be unlikely to identify CWP patients. All agreed that the following musculoskeletal complaints were unlikely to represent CWP patients: clearly identified underlying pathology (determined via clear investigative evidence, secondary care diagnosis, or strong clinical indication); injury or trauma; vertebral condition with myelopathy; structural problem (e.g. meniscal tear); strain/sprain. To form code list C (RRC-clinician), consultations classified in categories identified by the advisory panel as being unlikely to represent a patient with CWP were excluded from the list of all regional musculoskeletal Read codes.

From the list of all regional musculoskeletal codes, 736 remained after exclusion of those felt to be unlikely (by the advisory panel) to be used in patients presenting with unexplained musculoskeletal symptoms (i.e. unlikely to be used for CWP patients). Of these 736 codes, 594 were regional pain codes, 26 were generalised pain, and 116 were ambiguous. The 594 regional codes were used to identify the RRC-clinician group (see Figure 5.1). Of the regional complaints, there were 205 axial, 189 lower extremity, and 162 upper extremity codes (see appendix 5.2 for code list). The remaining regional codes had no site specified.

d. Application of code lists

Rohrbeck's 2007 code list (A. RRC-Rohrbeck) and the two new code sets (B. RRC-all: all regional musculoskeletal codes; C. RRC-clinician: clinician defined regional musculoskeletal codes) were used with Rohrbeck's 2007 criteria (as presented in Table 5.1). All consultations for the period 2005 to 2009 with patients fully registered with the CiPCA practices during that five-year period (2005 to 2009) were searched using the criteria to identify RRCs. No age limitations were set.

The codes were applied to the Rohrbeck-2007 criteria using the following rationale:

- One consultation for a musculoskeletal complaint in the axial skeleton: correlates with one consultation coded with an axial code.
- One consultation for an upper- or lower-limb complaint: correlates with one consultation with an upper-limb or lower-limb code.
- One consultation for a regional musculoskeletal complaint coded in each of three separate years: correlates with one regional (axial, upper-limb, lower-limb, or site unspecified) musculoskeletal complaint in each of three separate years.
- At least four consultations for regional musculoskeletal complaints in total during the five-year period: correlates with four consultations with a regional musculoskeletal code during the five-year period.

Controls were patients (fully registered between 2005 to 2009) recorded with a musculoskeletal problem in only one region (axial, upper limb or lower limb) during the five-year period (2005–2009). Controls had no musculoskeletal consultations recorded with codes classified as either generalised or ambiguous.

5.3.2 Calculation of prevalence figures

Specific aims addressed:

4. To establish the construct validity of the RRC definition as a measure of CWP in primary care using each of the code lists by investigating the following hypotheses: 4.1) The consulting prevalence of RRCs approaches the estimated consultation prevalence of CWP (8%); and 4.2) The age and gender distributions of RRCs more closely resembles those expected from patients with CWP than those of a control group who consult only for single site musculoskeletal problems. Specifically, cases are more likely to be older and female than controls.

Five-year consultation period prevalences for recurrent regional consulting using each of the three RRC codes lists, and the prevalence for controls, were calculated. Prevalence was calculated only for consultations conducted in primary care; coded hospital consultations were not included. The denominator population was patients fully registered between 2005 and 2009 with practices in the CiPCA archive. Prevalence figures were recorded per 10,000 population. Prevalence figures were calculated for the 12 practices in the CiPCA dataset for which there were complete data for the years 2005–2009. Both crude and standardised figures were calculated. Prevalence figures were standardised by the direct method to the UK general population age-gender structure provided by the Office for National Statistics (2011). Overall prevalence and prevalence by age, gender, and primary care practice was compared between controls and cases returned using each of the three codes lists.

Prevalence was stratified by age and gender. The age stratification was in the following age bands: 14 and under; 15–24; 25–44; 45–64; 65–74; and 75+.

Five-year prevalence and age and gender distribution of any musculoskeletal consultation was calculated to offer a comparison to the prevalence of RRC and of single-region consultation (controls). Musculoskeletal consultation prevalence was determined for those fully registered between 2005 and 2009, this population was used as the denominator in calculations.

The percentage of individuals recorded with any musculoskeletal code over the five-year period (2005–2009) who were also identified as RRCs was calculated to investigate the overlap of RRC consultation pattern with all regional musculoskeletal coding.

Confidence intervals for prevalence figures were calculated using Wilson's method (Newcombe 1998). A spreadsheet was developed for this purpose, incorporating formulae for calculating these intervals at the 95% confidence level.

5.3.3 Comorbidity

Specific aims addressed:

4. To establish the construct validity of the RRC definition as a measure of CWP in primary care using each of the code lists by investigating the following hypothesis: 4.3) Comorbidity is higher in RRCs than in controls.

All cause comorbidity was measured using consultation counts for non-musculoskeletal conditions, and consultations stratified by Read code chapter. For each case group and the control group the mean number of non-musculoskeletal consultations in the five years between 2005 and 2009 was calculated. Non-musculoskeletal consultations were those not coded with the musculoskeletal Read codes identified by Jordan et al. (2010). For each case group and the control group the percentage of the group recorded as consulting in each diagnostic (A–Z) Read code chapter was also calculated to establish the burden of disease in each of the body systems defined by the Read code chapter structure.

5.3.4 Somatic symptom count

Specific aims addressed:

4. To establish the construct validity of the RRC definition as a measure of CWP in primary care using each of the code lists by investigating the following hypothesis: 4.4) The number of somatic symptoms in RRCs is higher than in controls.

Physical symptoms itemised in the ACR-2010 criteria for FM (Wolfe et al. 2010) were used to conduct a systematic search of the Read code browser (NHS Clinical Terminology Browser, version 1.04, 2000) to identify corresponding Read codes. Three hundred and forty codes were identified corresponding to 40 of the 42 somatic symptoms. No codes relating to 'sun sensitivity' or 'waking unrefreshed' were found. The list of somatic symptoms and associated Read codes is included in appendix A5.3.

For each patient the number of somatic symptoms recorded in the period 2005–2009 was calculated. Mean and median somatic symptom counts were compared for cases and controls. The odds of being recorded with at least one somatic symptom was calculated for each RRC group against controls. Logistic regression was used to calculate an adjusted odds ratio for each

case group relative to the control group, controlling for age, gender and frequent attender status (using SPPS version 20, IBM 2011). Frequent attender status was defined as stated in the next section (5.3.5).

5.3.5 Frequent attenders

Specific aims addressed:

4. To establish the construct validity of the RRC definition as a measure of CWP in primary care using each of the code lists by investigating the following hypotheses: 4.5) The percentage of RRCs who are frequent attenders is higher than for controls; and 4.6) The percentage of frequent attenders who are also RRCs is consistent with that expected from patients with CWP (20–30% of frequent attenders have medically unexplained symptoms (Karlsson et al. 1997, Jyväsjärvi et al. 2001, Reid et al. 2001b, Smits et al. 2009); CWP is a subset of medically unexplained symptoms, therefore, less than 30% of frequent attenders should fulfil CWP criteria).

Frequent attendance was defined using consultations for non-musculoskeletal consultations only. By definition, RRCs are likely to have a higher number of musculoskeletal consultations than controls.

A systematic review of frequent attenders in primary care found disparity in the definition of frequent attendance (Vedsted and Christensen 2005). Given the lack of consensus, for the purposes of this study, non-musculoskeletal frequent attenders were defined as the top 5% and 10% of consulters for non-musculoskeletal problems (identified from those fully registered between 2005 and 2009) in each of the CiPCA practices for the five-year period 2005 to 2009. Non-musculoskeletal problems were defined as consultations coded with any Read code (including numeric Chapters 0–9: history, examination, procedural and administrative codes; and Chapters A–Z: diagnostic codes) except the musculoskeletal codes identified by Jordan et al. (2010). The percentage of frequent attenders who were case/controls, and the percentage of cases/controls who were frequent attenders was calculated. Frequent attendance defined in this way is also an indirect measure of comorbidity.

The relative odds of being a frequent attender (top 10% of consulters) were calculated for each RRC group against controls. Logistic regression was used to calculate an adjusted odds ratio for each case group relative to the control group controlling for age and gender.

5.3.6 Generalised pain

Specific aims addressed:

3. Establish how much 'unrecognised' CWP the RRC definition identifies by exploring the overlap between recurrent regional pain consultation (RRC) and recorded non-specific generalised pain consultation ('recognised' CWP e.g. FM).
4. To establish the construct validity of the RRC definition as a measure of CWP in primary care using each of the code lists by investigating the following hypothesis: 4.7) The percentage of patients recorded with differential diagnoses for FM/CWP (e.g. rheumatoid arthritis, SLE) is similar for cases and controls.

a. Overlap with non-specific generalised pain coding (recognised CWP)

The degree of overlap between recurrent regional pain consultation (RRC) and recorded non-specific generalised pain consultation ('recognised' CWP) was explored. The percentage of RRCs recorded as also recorded as consulting for non-specific generalised pain complaints related to CWP (e.g. fibromyalgia, identified using Read codes identified in the previous chapter, see appendix 4.1: Table A4.4) between the years 2005 and 2009 was calculated. Controls, by definition, had not consulted for generalised pain complaints and were therefore excluded from this analysis. The percentage of non-specific pain consulters who were also RRCs was calculated.

b. Overlap with specific widespread pain conditions (CWP differential diagnoses)

To explore the specificity of the RRC criteria for CWP/FM, the percentage of cases and controls also coded with conditions that might be included in a differential diagnosis of FM/CWP was investigated. Patients recorded in the five-year study period with Read codes for the following conditions were identified: rheumatoid arthritis (RA), systemic lupus erythematosus (SLE), Sjögren's syndrome, polymyalgia rheumatica (PMR), ankylosing spondylitis (AS), and hypothyroidism. These conditions were identified by Goldenberg (2009) as potential differential diagnoses for FM. Read codes were identified via a systematic search for clinical terms (identified using medical subject headings (MeSH) in Medline) related to the conditions listed using the Read-code browser (NHS Clinical Terminology Browser, version 1.04, 2000). The Read codes identified are presented in Table A5.4 in the appendix. The number of RRCs and controls recorded as consulting for defined widespread pain conditions was used to calculate the percentage of cases and controls with alternative explanations (other than CWP) for their symptoms. It should be noted that a diagnosis of FM/CWP does not exclude alternative comorbid diagnoses. Therefore, a patient identified as a RRC and recorded as consulting for one of the

alternative conditions listed above, may have both conditions (for example a patient could have both rheumatoid arthritis and CWP).

5.4 Results

Overarching aims addressed throughout:

1. To apply the Rohrbeck-2007 criteria for recurrent regional musculoskeletal consulters (RRC) using the following three code lists: A. Rohrbeck (2007) original short code list (RRC-Rohrbeck); B. All regional musculoskeletal codes (RRC-all); and C. excluding from B) all those codes identified by clinicians as being unlikely to represent CWP (RRC-clinician).
2. To explore similarities and differences in age and gender distribution, prevalence, number of recorded somatic symptoms, comorbidity, levels of frequent attendance, and degree of overlap with non-specific generalised pain recording, between RRCs returned using the three alternative code sets.

5.4.1 Denominator population

The study population (patients fully registered with practices in the CiPCA archive between 2005 and 2009) were comparable on gender distribution with the UK 2009 population. However, the study population had a higher proportion of older people than the UK general population, with more aged 45 and over (see Chapter Four, Table 4.1).

5.4.2 Prevalence

Specific aims addressed:

4. To establish the construct validity of the RRC definition as a measure of CWP in primary care using each of the code lists by investigating the following hypotheses: 4.1) The consulting prevalence of RRCs approaches the estimated consultation prevalence of CWP (8%); and 4.2) The age and gender distributions of RRCs more closely resembles those expected from patients with CWP than those of a control group who consult only for single site musculoskeletal problems. Specifically, cases are more likely to be older and female than controls.

a. Prevalence and age/gender variation

The number of cases identified ranged from 3,523 using the Rohrbeck short code list (RRC-Rohrbeck) to 9,172 using all regional musculoskeletal codes (RRC-all). 20,499 controls were identified (Table 5.2, Figure 5.2).

Five-year prevalence of recurrent regional consultation varied between 442 per 10,000 for RRC-Rohrbeck (cases identified using the Rohrbeck-2007 short code list C), to 1,149 for RRC-all (cases identified using all regional musculoskeletal codes, code list A) (Table 5.3 and Figure 5.2). Prevalence of patients meeting the control criteria (single-region consultation only) was substantially higher than for cases, at 2,569 per 10,000. RRC prevalence was higher in females than males for all age groups. The control group prevalence was similar by gender in the younger age groups, but, higher in men aged 45 years and over. RRC prevalence increased with age, while for controls there was a peak prevalence in those aged 25 to 44.

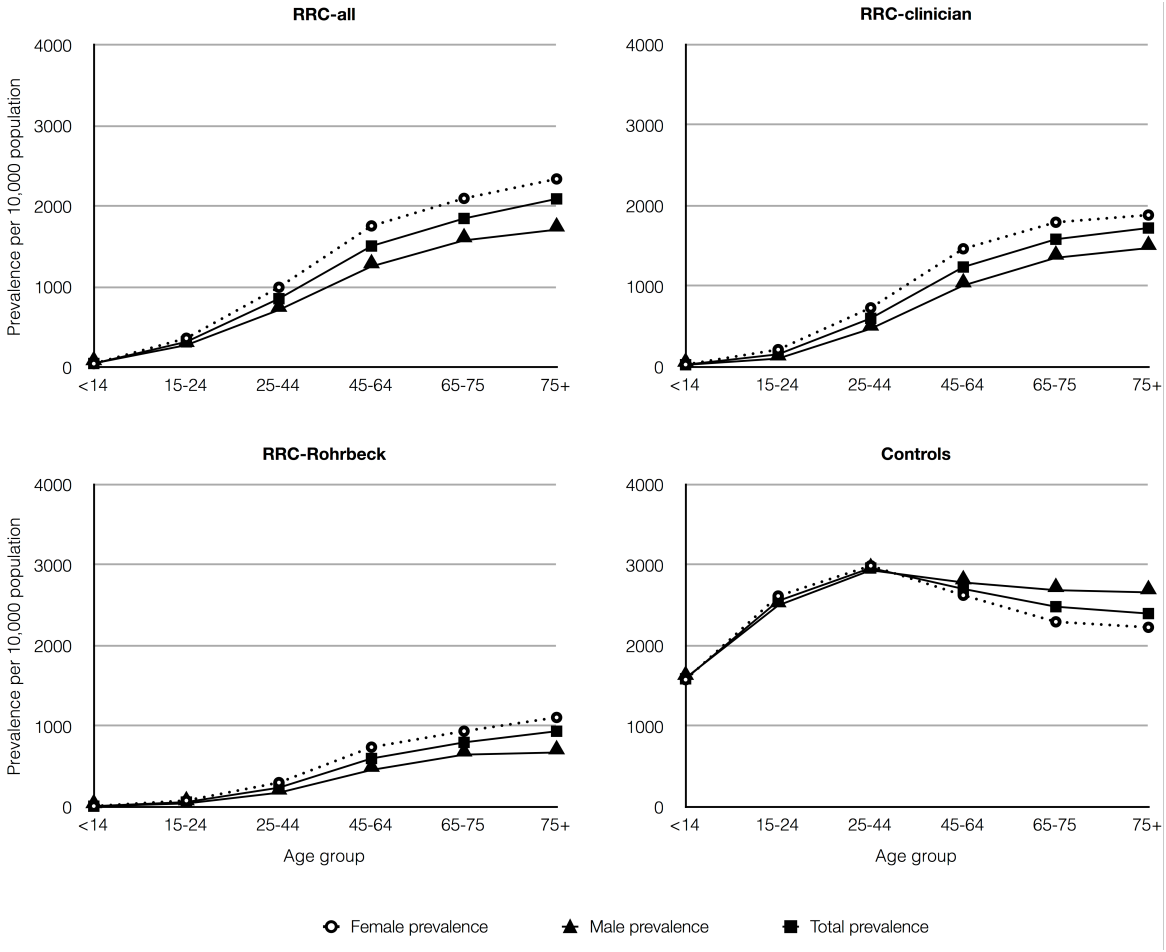
Table 5.2 Age and gender distribution in fully registered (2005–2009) cases and controls.

	Patient group			
Variable	**RRC-all**	**RRC-clinician**	**RRC-Rohrbeck**	**Control**
Age group				
<14	39 (0.4%)	21 (0.3%)	5 (0.1%)	1,346 (6.6%)
15–24	304 (3.3%)	149 (2.0%)	55 (1.6%)	2,467 (12.0%)
25–44	1,639 (17.9%)	1,157 (15.8%)	454 (12.9%)	5,709 (27.9%)
45–64	3,652 (39.8%)	3,005 (41.1%)	1,452 (41.2%)	6,564 (32.0%)
65–74	1,793 (19.5%)	1,537 (21.0%)	775 (22.0%)	2,411 (11.8%)
>75	1,745 (19.0%)	1,438 (19.7%)	782 (22.2%)	2,002 (9.8%)
Total	9,172	7,307	3,523	20,499
Gender				
Female	5,522 (60.2%)	4460 (61.0%)	2,262 (64.2%)	10,215 (49.8%)
Male	3,650 (39.8%)	2847 (39.0%)	1,261 (35.8%)	10,284 (50.2%)
Male:female ratio	0.66	0.64	0.56	1.01

Table 5.3 Five-year prevalence per 10,000 population (95% CI) in cases and controls fully registered 2005–2009

Variable	Patient group											
	RRC-all			RRC-clinician			RRC-Rohrbeck			Control		
Age group	Female	Male	Total	Female	Male	Total	Female	Male	Total	Female	Male	Total
<14	44	48	46	27	23	25	7	5	6	1,576	1,596	1,586
	(28, 69)	(31, 73)	(34, 63)	(15, 48)	(12, 42)	(16, 38)	(2, 21)	(1, 17)	(3, 14)	(1,468, 1,690)	(1,491, 1,708)	(1,510, 1,666)
15–24	359	274	315	212	101	154	76	40	57	2,614	2,497	2,553
	(309, 417)	(232, 322)	(282, 351)	(174, 258)	(77, 133)	(131, 181)	(54, 105)	(26, 61)	(44, 74)	(2,489, 2,742)	(2,379, 2,618)	(2,467, 2,641)
25–44	1,753	710	850	731	471	600	299	173	235	2,989	2,933	2,961
	(933, 1,053)	(661, 763)	(812, 890)	(680, 784)	(431, 515)	(567, 635)	(266, 335)	(149, 201)	(215, 258)	(2,898, 3,082)	(2,844, 3,025)	(2,897, 3,026)
45–64	2,094	1,251	1,503	1,463	1,008	1,237	738	455	598	2,623	2,782	2,702
	(1,687, 1,821)	(1,193, 1,311)	(1,459, 1,549)	(1,402, 1,527)	(955, 1,063)	(1,196, 1,279)	(693, 786)	(420, 494)	(569, 628)	(2,546, 2,702)	(2,703, 2,862)	(2,646, 2,758)
65–74	2,094	1,573	1,845	1,793	1,352	1,582	937	646	798	2,293	2,686	2,481
	(1,984, 2,208)	(1,472, 1,681)	(1,769, 1,924)	(1,689, 1,901)	(1,256, 1,453)	(1,511, 1,656)	(860, 1,020)	(579, 720)	(745, 853)	(2,180, 2,411)	(2,561, 2,816)	(2,396, 2,568)
>75	2,336	1,707	2,088	1,882	1,472	1,721	1,107	672	936	2,225	2,659	2,396
	(2,221, 2,454)	(1,582, 1,839)	(2,003, 2,177)	(1,777, 1,992)	(1,355, 1,598)	(1,641, 1,803)	(1,023, 1,196)	(592, 763)	(875, 1,000)	(2,113, 2,342)	(2,511, 2,813)	(2,306, 2,489)
Total	**1,358**	**933**	**1,149**	**1,097**	**728**	**916**	**556**	**322**	**442**	**2,512**	**2,628**	**2,569**
	(1,325, 1,391)	(904, 962)	(1,127, 1,172)	(1,067, 1,127)	(702, 754)	(896, 936)	(534, 579)	(305, 340)	(427, 456)	(2,470, 2,554)	(2,585, 2,672)	(2,539, 2,599)

Figure 5.2 Five-year prevalence (per 10,000 population) in cases and controls for patients fully registered 2005–2009.



Age-gender standardised figures were slightly lower than crude figures for cases, and similar for controls (see Table 5.4).

Table 5.4 Crude and standardised five-year prevalence figures per 10,000 population (95% CI) for cases and controls.

Patient group	Crude (95% CI)	Standardised* (95% CI)
RRC - all	1,149 (1,127, 1,171)	987 (966, 1,007)
RRC - Clinician	916 (896, 936)	774 (756, 792)
RRC - Rohrbeck	442 (428, 456)	367 (354, 379)
Controls	2,569 (2,539, 2,599)	2,516 (2,480, 2,551)

*Standardised to UK general population figures for 2009, source: Office for National Statistics (2011)

b. Practice variation

There was some variation in prevalence across the 12 general practices included in the study (see Table 5.5). For example, RRC-all prevalence ranged from 882 to 1,435 per 10,000 across practices; although seven practices had a narrower range with prevalences of between 1,000 and 1,300 per 10,000.

Table 5.5 Five-year prevalence figure per 10,000 population (95% CI) for cases and controls, stratified by practice.

Practice	RRC-all	RRC-Clinician	RRC-Rohrbeck	Control
9	882 (817, 952)	636 (581, 697)	299 (261, 342)	2,420 (2,320, 2,524)
7	933 (842, 1,033)	771 (688, 863)	339 (284, 404)	2,558 (2,418, 2,704)
6	1,003 (928, 1,084)	750 (685, 821)	394 (347, 448)	2,698 (2,584, 2,814)
8	1,023 (942, 1,112)	829 (755, 910)	253 (213, 301)	2,451 (2,333, 2,574)
1	1,068 (994, 1,148)	777 (713, 847)	357 (313, 406)	2,544 (2,437, 2,654)
11	1,078 (1,013, 1,147)	840 (782, 902)	226 (196, 261)	2,459 (2,366, 2,553)
3	1,136 (1,076, 1,198)	958 (903, 1,016)	514 (473, 558)	2,722 (2,637, 2,808)
12	1,171 (1,104, 1,242)	949 (888, 1,014)	571 (523, 623)	2,471 (2,380, 2,565)
4	1,279 (1,209, 1,353)	1,017 (954, 1,084)	500 (455, 549)	2,660 (2,566, 2,756)
5	1,334 (1,260, 1,410)	1,072 (1,006, 1,142)	529 (482, 581)	2,448 (2,354, 2,544)
2	1,397 (1,309, 1,490)	1,140 (1,060, 1,226)	647 (585, 714)	2,706 (2,592, 2,824)
10	1,435 (1,331, 1,546)	1,211 (1,114, 1,315)	601 (532, 678)	2,715 (2,581, 2,854)

c. Five-year musculoskeletal coding prevalence

The five-year coding prevalence for any musculoskeletal problem was considerably higher (5,963 per 10,000) than that observed for RRCs (442 to 1,149 per 10,000) and controls (2,569 per 10,000) (see Table 5.6). However, the age and gender distributions were similar to those observed in RRCs. Prevalence of musculoskeletal coding increased with age and was higher in women.

Table 5.6 Five-year coding prevalence per 10,000 population (95% CI) for any musculoskeletal Read code in those fully registered with the CiPCA practices 2005–2009.

	Prevalence per 10,000 population (95% CI)		
Age group	Female	Male	Total
<14	2,396 (2,268, 2,529)	2,501 (2,375, 2,631)	2,450 (2,360, 2,543)
15–24	4,561 (4,418, 4,705)	4,155 (4,020, 4,292)	4,349 (4,250, 4,448)
25–44	6,212 (6,614, 6,309)	5,457 (5,358, 5,556)	5,832 (5,762, 5,901)
45–64	7,237 (7,157, 7,316)	6,364 (6,278, 6,449)	6,803 (6,744, 6,862)
65–74	7,559 (7,439, 7,675)	7,000 (6,867, 7,130)	7,291 (7,202, 7,378)
>75	8,041 (7,929, 8,148)	7,210 (7,054, 7,361)	7,714 (7,623, 7,803)
Total	**6,343 (6,296, 6,390)**	**5,569 (5,520, 5,618)**	**5,963 (5,929, 5,997)**

5.4.3 Comorbidity

Specific aims addressed:

4. To establish the construct validity of the RRC definition as a measure of CWP in primary care using each of the code lists by investigating the following hypothesis: 4.3) Comorbidity is higher in RRCs than in controls.

a. Consultation count

Mean non-musculoskeletal consultation counts varied from 20 consultations in the period 2005 to 2009 for controls, to between 39 and 42 consultations in the five-year period for cases. The distribution of figures in all groups was positively skewed, with the majority of patients having a lower number of consultations and a few individuals attending much more frequently (Table 5.7).

Controls were not age-matched with cases and there was a difference in the age distribution of cases and controls. Cases were older than controls; between 78 and 85% of cases were 45 years or over compared to only 54% of controls (Table 5.2). However, the disparity between cases and controls in mean and median number of non-musculoskeletal consultations persisted when restricting the analysis to those aged 45 and over.

Table 5.7 Non-musculoskeletal consultation count for the 5 years period 2005–2009 for each patient group.

	Total number of non-MS consultations 2005–2009				
Patient Group	**Mean (sd)**	**Median (IQR)**	**Min No**	**Max No**	**n**
All age groups					
RRC - All regional MS codes	39 (26)	35 (21, 51)	0	344	**9,172**
RRC - Clinician defined codes	41 (26)	36 (22, 53)	0	344	**7,307**
RRC - Rohrbeck-2007 code list	42 (26)	37 (24, 54)	0	344	**3,523**
Controls	20 (17)	16 (8, 28)	0	254	**20,499**
Cases/controls aged 45+					
RRC - All regional MS codes	41 (26)	37 (23, 53)	0	344	**7,190**
RRC - Clinician defined codes	42 (26)	37 (24, 54)	0	344	**5,980**
RRC - Rohrbeck-2007 code list	43 (26)	38 (25, 55)	0	344	**3,009**
Controls	23 (17)	20 (10, 32)	0	254	**10,977**

IQR: Inter quartile range
sd: standard deviation

b. Consultation by Read code chapter

The percentage of cases and controls recorded with a consultation in each Read code chapter is displayed in Figure 5.3 (excluding chapters with low consultation rates: Chapters Q, P, L, U and D) to aid interpretation of the figures presented in Table 5.8.

Figure 5.3 Percentage of patients consulting in each Read code chapter (2005–2009) for cases and controls. Excluding chapters with low consultation rates (Chapters Q, P, L, U and D) and numerical chapters.

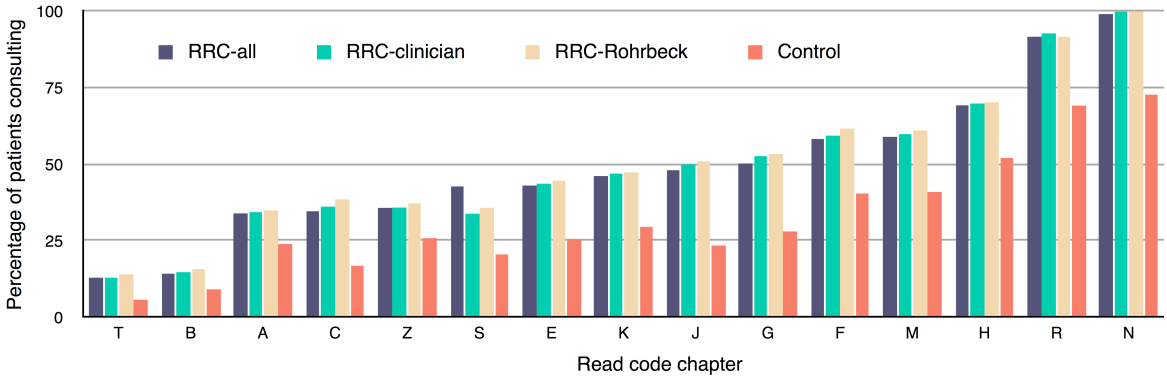


Table 5.8 Number (%) of patients consulting in each Read code chapter (excluding Chapter N and numeric chapters) for cases and controls between 2005 and 2009.

Read code chapter	Number of patients recorded in Read code chapter (%)			
	RRC-all	***RRC-clinician***	***RRC-Rohrbeck***	***Control***
R [D] Symptoms, signs and ill-defined conditions*	8,389 (92)	6,763 (93)	3,225 (92)	14,139 (69)
H Respiratory system diseases	6,337 (69)	5,094 (70)	2,471 (70)	10,649 (52)
M Skin/subcutaneous tissue diseases	5,393 (59)	4,359 (60)	2,146 (61)	8,355 (41)
F Nervous system/sensory organ diseases	5,329 (58)	4,329 (59)	2,166 (62)	8,264 (40)
G Circulatory system diseases	4,599 (50)	3,838 (53)	1,873 (53)	5,710 (28)
J Digestive system diseases	4,395 (48)	3,639 (50)	1,790 (51)	4,782 (23)
K Genitourinary system diseases	4,217 (46)	3,420 (47)	1,664 (47)	6,029 (29)
E Mental disorders	3,932 (43)	3,182 (44)	1,566 (45)	5,165 (25)
S Injury and poisoning*	3,906 (43)	2,461 (34)	1,255 (36)	4,182 (20)
Z Other disease/injury	3,267 (36)	2,610 (36)	1,306 (37)	5,266 (26)
C Endocrine/nutritional/metabolic/immunological diseases	3,161 (35)	2,628 (36)	1,352 (38)	3,429 (17)
A Infectious/parasitic diseases	3,104 (34)	2,499 (34)	1,227 (35)	4,869 (24)
B Neoplasms	1,293 (14)	1,066 (15)	548 (16)	1,847 (9)
T Causes of injury/poisoning	1,175 (13)	933 (13)	488 (14)	1,142 (6)
D Blood/blood forming organ diseases	634 (7)	531 (7)	259 (7)	641 (3)
U [X]External causes morbidity/mortality	338 (4)	264 (4)	144 (4)	335 (2)
L Pregnancy/childbirth/puerperium	125 (1)	89 (1)	44 (1)	335 (2)
P Congenital anomalies	102 (1)	82 (1)	36 (1)	189 (1)
Q Perinatal conditions	10 (0)	7 (0)	6 (0)	13 (0)

NB: Musculoskeletal codes from Chapters R and S are included in the code lists used to identify cases and controls.

The percentage of patients consulting was lower for controls across all Read code chapters. There was a reasonably similar percentage of patients consulting in each chapter for each case group. Using just the Rohrbeck short code list (RRC-Rohrbeck) gave a slightly higher percentage of people consulting for most chapters. However, there was a higher percentage of patients consulting in Chapter S (Injury and poisoning) in the RRC-all group (cases identified using all regional musculoskeletal codes).

5.4.4 Somatic symptoms

Specific aims addressed:

4. To establish the construct validity of the RRC definition as a measure of CWP in primary care using each of the code lists by investigating the following hypothesis: 4.4) The number of somatic symptoms in RRCs is higher than in controls.

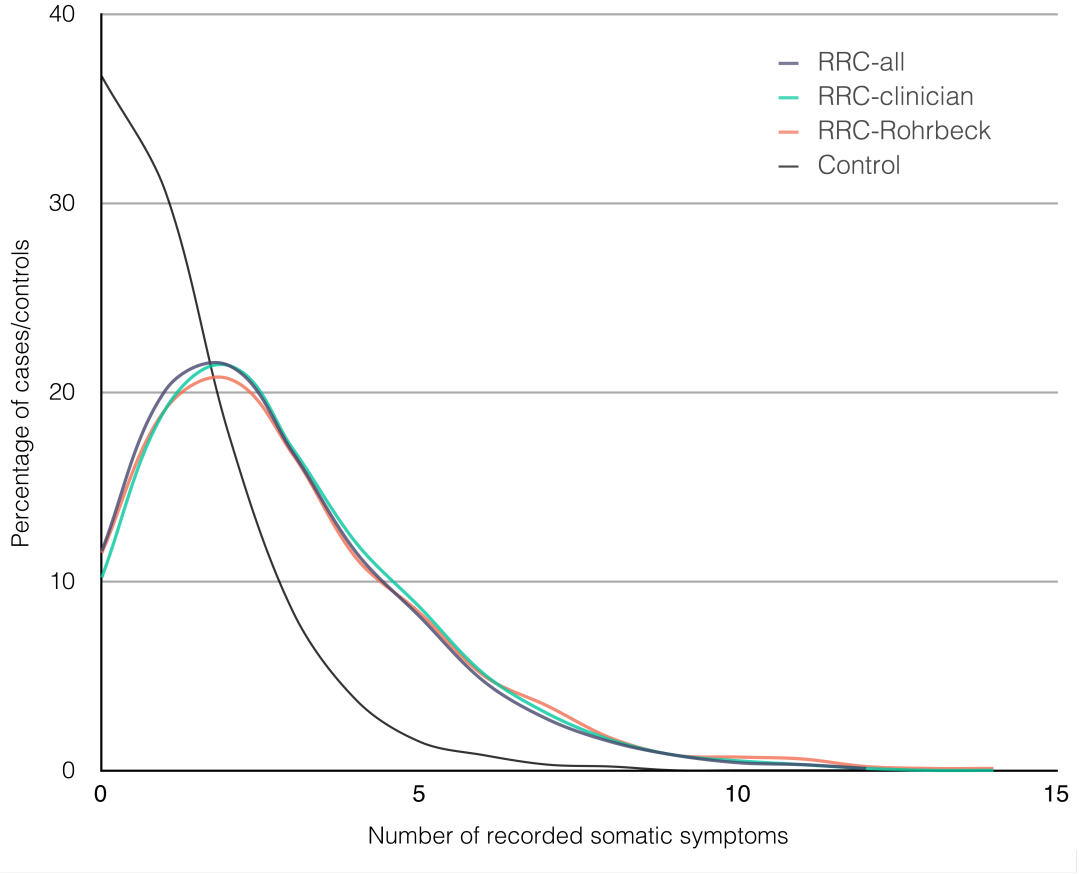
Between 88 and 90% of cases were recorded with one or more somatic symptoms compared to 63% of controls. The mean number of somatic symptoms for the five-year period 2005 to 2009 was lower in controls compared to cases, ranging from 1.22 in control patients to 2.89 in the RRC-Rohrbeck group (RRCs identified using the Rohrbeck-2007 code list). The mean number of somatic symptoms was similar across the three groups of cases (range from 2.75 to 2.89). Looking at somatic symptom count in only those cases/controls aged 45 years and over, there was little difference compared to that seen for all ages. Mean somatic symptom count figures are shown in Table 5.9 and the distribution of somatic symptom counts is illustrated in Figure 5.4.

Table 5.9 Somatic symptom count for the 5 year period 2005–2009 for cases and controls.

Patient Group	Number of somatic symptoms 2005–2009				Number (%) with one or more somatic symptoms	n
	Mean (sd)	Median (IQR)	Min No	Max No		
All age groups						
RRC-all	2.75 (2.13)	2 (1,4)	0	16	8,104 (88%)	**9,172**
RRC-clinician	2.88 (2.16)	2 (1,4)	0	16	6,560 (90%)	**7,307**
RRC-Rohrbeck	2.89 (2.27)	2 (1,4)	0	16	3,118 (89%)	**3,523**
Controls	1.22 (1.35)	1 (0, 2)	0	10	12,977 (63%)	**20,499**
Cases/controls aged 45+						
RRC-all	2.76 (2.12)	2 (1,4)	0	16	6,370 (89%)	**7,190**
RRC-clinician	2.87 (2.14)	2 (1,4)	0	16	5,374 (90%)	**5,980**
RRC-Rohrbeck	2.88 (2.25)	2 (1,4)	0	16	2,663 (89%)	**3,009**
Controls	1.20 (1.35)	1 (0, 2)	0	10	6,872 (63%)	**10,977**

sd: standard deviation
IQR: Inter quartile range

Figure 5.4 Distribution of number of recorded somatic symptoms (2005–2009) for cases/controls.



As Table 5.10 shows, the odds ratio for the association of RRC group with the recording of one or more somatic symptoms was 4.40 for the RRC-all group, 5.09 for RRC-clinician, and 4.46 for the RRC-Rohrbeck group compared to the control group. Adjustment for age and gender reduced the odds ratios slightly to 4.20 for the RRC-all group, 4.84 for RRC-clinician, and 4.14 for RRC-Rohrbeck but there remained a strong and significant association between RRC status and having a recorded somatic symptom. Adjusting for frequent attender status in addition to age and gender reduced the odds of being recorded with a somatic symptom further, but again a strong and significant association between RRC status and somatic symptom recording remained.

Table 5.10 Odds ratios (95% confidence interval) for the recording of one or more somatic symptoms in each group of cases.

Patient group	Odds ratio (95% CI)		
	Crude	Adjusted* (age & gender)	Adjusted* (age, gender and frequent attender status)
RRC-all	4.40 (4.10, 4.72)	4.20 (3.90, 4.51)	3.44 (3.20, 3.70)
RRC-clinician	5.09 (4.70, 5.52)	4.84 (4.46, 5.26)	3.91 (3.59, 4.25)
RRC-Rohrbeck	4.46 (4.01, 4.97)	4.14 (3.71, 4.62)	3.26 (2.92, 3.65)

* Adjusted using logistic regression compared to controls.

5.4.5 Frequent attenders

Specific aims addressed:

4. To establish the construct validity of the RRC definition as a measure of CWP in primary care using each of the code lists by investigating the following hypotheses: 4.5) The percentage of RRCs who are frequent attenders is higher than for controls; and 4.6) The percentage of frequent attenders who are also RRCs is consistent with that expected from patients with CWP (20–30% of frequent attenders have medically unexplained symptoms (Karlsson et al. 1997, Jyväsjärvi et al. 2001, Reid et al. 2001b, Smits et al. 2009); CWP is a subset of medically unexplained symptoms, therefore, less than 30% of frequent attenders should fulfil CWP criteria).

In the fully-registered CiPCA population the mean consultation count over the five-year period 2005–2009 for frequent attenders was between 69 when defined as the top 10% of consulters, and 82 when defined as the top 5% (see Table 5.11). Minimum consultation count was 38 in the top 10% of consulters to a maximum of 398. The mean age of frequent attenders was between 60 and 61 for both frequent (top 10%) and very frequent attenders (top 5%). Women were more than twice as likely as men to be frequent attenders. Somatic symptom count ranged from a mean of 3.4 for frequent attenders (top 10%) to 3.9 for very frequent attenders (top 5%).

Table 5.11 Mean age, mean five-year consultation count and male:female ratio for non-musculoskeletal frequent attenders (identified from fully registered population 2005–2009 only).

	Mean age (sd)	male: female ratio	Consultation count			Mean non-MS consultation count (sd)	Mean MS consultation count (sd)	Mean somatic symptom count (sd)	Total
			Mean (sd)	Min	Max				
Top 10% non-MS FAs*	60 (19)	0.48	69 (24)	38	398	64 (22)	7 (8)	3.4 (2.2)	**7,691**
Top 5% non-MS FAs*	61 (19)	0.46	82 (26)	47	398	77 (24)	8 (9)	3.9 (2.4)	**3,850**

*non-MS FAs: non-musculoskeletal frequent attenders
MS: musculoskeletal

RRC cases were more likely to be frequent attenders than controls (see Table 5.12). The percentage of RRCs who were also frequent attenders (10% definition) was between 31% and 35% across the three case groups, with higher proportions seen in RRC-Rohrbeck cases, followed by the RRC-clinician, with RRC-all having the lowest proportion of frequent attenders. Frequent attenders accounted for substantially less of the control group (7% based on the 10% definition for frequent attendance). Similar results were observed when case/controls were limited to those aged 45 years an over (see appendix 5.5, Table A5.6).

Cases accounted for between 16% and 37% of all frequent attenders (10% definition). Reflecting the group sizes, the RRC-Rohrbeck cases accounted for the smallest number of frequent attenders, followed by RRC-clinician, with the RRC-all group of cases accounting for the highest percentage of frequent attenders. The RRC-all group accounted for up to 43% of the top 5% of consulters.

Controls accounted for 18% of non-musculoskeletal frequent attenders (10% definition).

Table 5.12 Cases and controls by frequent attendance status.

	number of patients (% cases/controls also frequent attenders, % frequent attenders identified as cases/controls)				
	RRC - All	RRC - Clinician	RRC - Rohrbeck	Controls	**n**
Top 10% non-MS FAs*	2,868 (31%, 37%)	2,418 (33%, 31%)	1,241 (35%, 16%)	1,416 (7%, 18%)	**7,691**
Top 5% non-MS FAs*	1,670 (18%, 43%)	1,429 (20%, 37%)	758 (22%, 20%)	597 (3%, 16%)	**3,850**
n	**9,172**	**7,307**	**3,523**	**20,499**	

*non-MS FAs: non-musculoskeletal frequent attenders

As Table 5.13 shows, the odds ratio associating RRC group with frequent attendance (top 10%) was 6.13 for the RRC-all group, 6.67 for RRC-clinician and 7.33 for the RRC-Rohrbeck group compared to controls. Adjustment for age and gender reduced the odds ratio noticeably to 4.83 for the RRC-all group, 5.16 for RRC-clinician, and 5.33 for RRC-Rohrbeck but still showed strong and significant associations between RRC status and frequent attendance.

Table 5.13 Odds ratios (95% confidence interval) for frequent attendance (top 10% of attenders) in each group of cases.

	Odds ratio (95% CI)	
Patient Group	**Crude**	**Adjusted* (age & gender)**
RRC-all	6.13 (5.72, 6.57)	4.83 (4.49, 5.19)
RRC-clinician	6.67 (6.20, 7.17)	5.16 (4.78, 5.57)
RRC-Rohrbeck	7.33 (6.71, 8.00)	5.33 (4.85, 5.84)

* Adjusted using logistic regression compared to controls.

5.4.6 Generalised pain

Specific aims addressed:

3. Establish how much 'unrecognised' CWP the RRC definition identifies by exploring the overlap between recurrent regional pain consultation (RRC) and recorded non-specific generalised pain consultation ('recognised' CWP e.g. FM).
4. To establish the construct validity of the criteria using each of the code lists by investigating the following hypothesis: 4.7) The percentage of patients recorded with differential diagnoses for FM/CWP (e.g. rheumatoid arthritis, SLE) is similar for cases and controls.

a. Overlap with non-specific generalised pain coding (recognised CWP)

The degree of overlap between non-specific generalised pain coding and RRCs is shown in Table 5.14. Patients recorded with non-specific pain complaints accounted for up to 26% of RRCs (depending on non-specific pain definition). There were similar proportions of non-specific pain consulters across all three groups of RRCs for each subgroup of non-specific pain coding (FM, generalised osteoarthritis, non-specific generalised pain). The RRC-all code list identified 42% of all patients with a record of fibromyalgia, whereas RRC-Rohrbeck identified approximately half that number (22%). This pattern was similar for generalised osteoarthritis, and all non-specific generalised pain.

Table 5.14 Number of RRCs consulting for non-specific pain complaints (percentage of RRCs with non-specific pain coding, percentage of non-specific pain consulters identified as RRCs).

	Number of patients (% RRCs with NS pain coding, % NS pain consulters also RRCs)			
	RRC - All	RRC - Clinician	RRC - Rohrbeck	**n**
FM*	123 (1%, 42%)	107 (1%, 37%)	64 (2%, 22%)	**290**
Generalised OA**	672 (7%, 38%)	577 (8%, 33%)	303 (9%, 17%)	**1,756**
All NS pain (exc. OA)	1,637 (18%, 32%)	1,407 (19%, 28%)	731 (21%, 14%)	**5,089**
All NS pain (inc. OA)	2,106 (23%, 33%)	1,803 (25%, 28%)	929 (26%, 14%)	**6,466**
n	**9,172**	**7,307**	**3,523**	

*FM = fibromyalgia
**OA = osteoarthritis
NS = non-specific

b. Overlap with specific widespread pain conditions (CWP differential diagnoses)

The degree of overlap between patients coded with specified alternative widespread pain diagnoses and cases/controls is shown in Table 5.15. The percentage of patients with alternative diagnoses recorded is low for both cases and controls, with the percentage with any alternative diagnoses ranging from 3% in controls to 8-9% for RRCs. Hypothyroidism accounted for the majority of alternative diagnoses, with 6-7% of RRCs also recorded with hypothyroidism.

Table 5.15 Number (%) of RRCs/controls recorded with differential diagnoses.

	Number of patients (% cases/controls with alternative diagnoses)				
	RRC - all	RRC - clinician	RRC - Rohrbeck	Controls	**n**
Rheumatoid arthritis	82 (1%)	65 (1%)	31 (1%)	0 (0%)	**476**
SLE*	5 (0%)	4 (0%)	4 (0%)	0 (0%)	**24**
Polymyalgia rheumatica	125 (1%)	108 (1%)	56 (2%)	0 (0%)	**360**
Ankylosing spondylitis	18 (0%)	5 (0%)	2 (0%)	28 (0%)	**60**
Sjögren's syndrome	8 (0%)	5 (0%)	2 (0%)	0 (0%)	**33**
Hypothyroidism	524 (6%)	418 (6%)	233 (7%)	515 (3%)	**2,162**
Any listed (above) differential diagnosis	734 (8%)	581 (8%)	318(9%)	543 (3%)	**3,029**
n	**9,172**	**7,307**	**3,523**	**20,499**	

*SLE = systemic lupus erythematosus

5.5 Discussion

We found recurrent multi-region consulters (RRCs) to be consistently different from single-site consulters (controls). RRCs were older, more likely to be female, had higher consultation rates for both musculoskeletal and non-musculoskeletal complaints, were more likely to be frequent attenders, had more recorded physical symptoms, and were more likely to be coded with non-specific generalised musculoskeletal pain codes, or codes for FM/CWP differential diagnoses. However, the percentage recorded with differential diagnosis codes were low.

Increasing the number of codes used to define a RRC increased the number of patients identified. However, increases in RRC prevalence were not in proportion to increased numbers of identifying codes. There were few differences in the profile of the patients in each group. The patients identified using all regional musculoskeletal codes has a similar age and gender distribution to the subgroups identified by the clinician-defined code list and the original Rohrbeck short code list. All three groups had similar non-musculoskeletal consultation rates, numbers of somatic symptoms, levels of comorbidity, frequent attendance, and recorded non-specific generalised pain and specific differential diagnoses. The only notable difference between the three groups of cases was the observation of a higher proportion of RRC-all patients recorded with consultations in Read code Chapter S – injury and poisoning. This might be accounted for by a higher number of injury codes included on the list of codes used to identify the RRC-all group compared to the other two groups of RRCs.

RRCs accounted for up to 42% of patients with a recorded non-specific generalised pain condition. The percentage of patients recorded with alternative diagnoses for FM/CWP was low for both RRCs and controls, but was higher in RRCs (8-9%) than controls (3%).

5.5.1 Prevalence

a. Total prevalence

The study population is older than the standard UK population (Table 5.2), however age and gender standardisation did not greatly change the estimated prevalence figures.

The requirement for a minimum of four musculoskeletal consultations to meet RRC criteria compared to only one consultation to define a control may account for the observation that prevalence in controls is at least double that in cases. However, it might also reflect population differences in single- and multi-site pain prevalence (Carnes et al. 2007, Clark 2002). The RRC criteria's requirement for a specific number of consultations over time suggests chronicity of musculoskeletal complaints in cases. Meanwhile, with a requirement for only one consultation, we might expect to see more acute problems in controls. Differences observed might therefore also be accounted for by differences in acute and chronic pain prevalence.

The RRC definition identified a group of people who consult regularly for multi-site musculoskeletal pain with prevalence ranging from 449 to 1,149 per 10,000 registered population depending on the code list used. Estimated figures for community CWP prevalence (1,077 per 10,000 see Chapter Three) and expected annual consultation rate (in a cross-sectional study 72% of CWP patients were shown to consult for their pain, Macfarlane et al. 1999) suggest some of these RRCs, particularly using the RRC-all code list, might not have CWP. However, we are comparing five-year consultation prevalence with annual or point community prevalence, and previous research (Carnes et al. 2007) suggests that only a third of chronic multi-site pain patients would fit strict CWP criteria (Carnes et al. 2007). Therefore a RRC prevalence higher than expected based on community CWP prevalence does not mean that RRCs do not have long-term multi-site pain.

Differences in prevalence observed across the three groups of cases is undoubtedly explained by the increased numbers of codes used to identify patients. The Rohrbeck code list comprised 147 codes, the clinician defined code list comprised 736, and all regional codes numbered 4,481. However, the increases in prevalence are not in proportion to the increase in numbers of codes. For example, comparing the RRC-all and RRC-clinician codes lists we might anticipate a more substantial increase in prevalence given an increase of 3,745 codes (RRC-all: 1,149/10,000

population compared to RRC-clinician: 916/10,000). This suggests that many of the additional codes added by the alternative code lists were not used for this type of patient. This might imply that clinicians have a reasonable picture of the type of coding that might be used for unrecognised CWP.

b. Variation in prevalence with age

Community studies show increasing CWP prevalence with increasing age and/or a peak in middle age with some studies suggesting a decline in older age groups (see section 3.4.5.d). The pattern of age distribution in the RRCs identified in this study is not entirely consistent with population patterns for CWP; however, RRCs do show an increasing prevalence with increasing age, which we would expect from some general population studies, and any inconsistencies between RRCs and community CWP may be due to systematic differences in this subgroup of unrecognised CWP consulters. The demographics of RRCs will be explored further in Chapter Nine.

c. Variation in prevalence with sex

Fifteen papers included in the systematic review (presented in Chapter Three) provided prevalence figures for CWP stratified by gender. CWP was more common in women in all 15 papers, with the majority showing prevalence in women to be at least twice that in men. Male-to-female ratios observed for RRCs in this study are comparable to those observed in the systematic review, ranging from 0.56 (RRC-Rohrbeck) to 0.66 (RRC-all). With respect to gender distribution, controls were substantially different from cases. The control group showed an overall equal number of men and women, but with higher prevalence in men at older ages.

The gender distribution of RRCs is also comparable to that found in the non-specific generalised musculoskeletal pain consulters (recognised CWP) investigated in the previous chapter (see Table 5.13), with the exception of FM consulters where coding prevalence was almost nine times more frequent in women.

While the gender variation observed in this study appears to support the construct of CWP, we must take into account that women have been shown to be more likely than men to seek help for symptoms (Cornally and McCarthy 2011, Sayer and Britt 1996). Therefore, while the results of the study show more female RRCs, this may partially be due to gender differences in help-seeking behaviour.

d. Practice variation

While there were some outlying practices in terms of prevalence of RRCs, there was some consistency in the figures (see Figure 5.2). The consistency across practices supports the RRC criteria as a useful measure since it appears to show little variation with the different coding habits and diagnostic beliefs in use in the 12 practices included in the study.

In contrast, the prevalence of patients with a recorded non-specific generalised pain complaint (see Chapter Four, section 4.4.1) showed substantial variability between practices. Non-specific generalised pain consulters were identified based on one or more consultations coded with specific Read codes, while RRCs were identified using consultation patterns for multiple codes. The observation of variability where codes alone are used to identify patient groups versus less variation when consultation patterns are used supports the RRC criteria as a useful tool to identify patients, since the consultation pattern may smooth out differences in coding practices.

e. Comparison with five-year musculoskeletal coding prevalence

The age and gender distributions for the prevalence of any musculoskeletal consultation mirrored those seen in RRCs with a higher prevalence in women and increasing prevalence with age. However, only 19% of patients recorded with any musculoskeletal code over five years were identified as RRC-all patients, demonstrating that the RRC consultation pattern is successfully identifying a subset of musculoskeletal consulters who consult repeatedly with multi-region complaints.

5.5.2 Comorbidity

Research has consistently demonstrated overlap between FM/CWP and other conditions for which there is no clearly defined pathology such as chronic fatigue and irritable bowel syndrome (Aaron et al. 2000, Aggarwal et al. 2006). There has also been a documented association between FM/CWP and psychiatric comorbidity (Benjamin et al. 2000). While greater psychological distress has been observed in FM patients than in CWP (White et al. 2002b), one in four CWP consulters has been shown to have a mental disorder (Macfarlane et al. 1999). FM/CWP patients have been shown to have worse self-reported general health (Bergman 2005, Rohrbeck et al. 2007) and CWP patients have also been shown to consult more frequently for both musculoskeletal and non-

musculoskeletal complaints (Kadam et al. 2005). These findings might lead us to expect higher levels of comorbidity in CWP patients.

In the original paper presenting the 'consultation-based widespread pain' criteria, Rohrbeck et al. used consultations for excessive earwax and cough as 'indicators of a general propensity to consult about common problems' (Rohrbeck et al. 2007, p.111). Consultations for these conditions were observed to be higher in consultation-based widespread pain cases than in controls, indicating a lower threshold for consultation. In this study we demonstrated that RRCs have higher non-musculoskeletal consultation rates and a higher percentage of people consulting in each Read code chapter than controls: findings that are consistent with CWP.

Cases identified using the Rohrbeck code list had the highest non-musculoskeletal consultation counts, followed by the clinician-defined code list, while the all-code list identified patients with the lowest consultation count. This suggests the original Rohrbeck code list identifies patients who might better fit strict CWP criteria. However, while using the inclusive all regional musculoskeletal codes list might result in less specificity, it identifies more patients, therefore potentially increasing its sensitivity. However, differences between the three case groups on number of comorbidities were small.

If we compare the percentage of cases/controls consulting in each Read code chapter, we see a similar relative pattern across the three case groups. For all chapters, the proportion of patients consulting is lower for controls than for cases. There is a substantially higher prevalence of consultations in Chapter S (injury and poisoning) in the RRC-all group. This reflects the higher proportion of Chapter S codes in the RRC-all code list and the consequent identification of more patients coded using Chapter S. The question arising from this observation is: Does this imply that the RRC-all patients are less likely to fit established criteria for CWP, as the RRC-all group might include more patients with acute musculoskeletal injury and its sequelae? A study by Buskila et al. (1997a) found that 22% of patients with acute neck soft-tissue injury were subsequently diagnosed with FM, compared to 2% of patients with leg fractures, suggesting that site-specific trauma might be involved in the aetiology of FM. We might therefore expect there to be more CWP following some types of injury; this is certainly consistent with osteopathic theory regarding distant biomechanical compensation for primary local dysfunction (Stone 1999, p.20–21). The

observation of a higher proportion of Chapter S coding for a group of cases does not generally indicate that they are less likely to fit criteria for CWP.

5.5.3 Somatic symptoms

The introduction of the somatic symptom scale to the ACR-2010 criteria for FM (Wolfe et al. 2010) emphasised the importance of somatic symptoms in CWP/FM. An alternative set of diagnostic criteria for FM, developed using evidence-based and consensus methods by a German interdisciplinary committee, also includes a requirement for somatic symptoms (Häuser et al. 2009a, 2010). Using the Somatic Symptom Checklist (SSC), a screening test of six items for somatization (McBeth et al. 2001b), one study has shown 53% of CWP patients to have one or more somatic symptoms (Aggarwal et al. 2006). Using the same checklist Gupta et al. (2007) demonstrated that 33% of patients with new CWP had one or more somatic symptoms.

In this study, the finding that there was a substantially lower number of somatic symptoms in control subjects compared to RRC cases suggests that RRC criteria are successfully identifying CWP patients. This observation is consistent with the findings of the original paper presenting the consultation-based widespread pain criteria (Rohrbeck et al. 2007). In terms of somatic symptom count there is little to differentiate between the three groups of cases.

5.5.4 Frequent attenders

Previous research has shown that 20–30% of frequent attenders have medically unexplained symptoms (Smits et al. 2009, Reid et al. 2001b) or can be considered to be somatizers (Karlsson et al. 1997, Jyväsjärvi et al. 2001). Frequent attenders are also more likely to have musculoskeletal problems (Jyväsjärvi et al. 1998, Karlsson et al. 1994, Foster et al. 2006). Persistent CWP has been found to be associated with frequent attendance (McBeth et al. 2001b), help-seeking behaviour for health problems has been demonstrated to be a risk factor for CWP onset (Gupta et al. 2007), and CWP patients have been found to consult more frequently than patients with no pain, independent of their level of psychological distress (Kadam et al. 2005), suggesting that frequent attendance is a feature of CWP. Our study found that RRCs were more likely to be frequent attenders, and to have more musculoskeletal and non-musculoskeletal consultations than controls, which is consistent with the construct of CWP.

However, a case can be made for there being a disproportionately high percentage of frequent attenders in the RRC groups. Our study showed that up to 37% of frequent attenders (top 10%) were RRCs. If up to 30% of frequent attenders have medically unexplained symptoms (Smits et al. 2009, Reid et al. 2001b), then, since those who exhibit recurrent regional consulting comprise a subgroup of CWP, which is, in turn, a subgroup of medically unexplained symptoms, we would perhaps expect fewer RRC frequent attenders than we found. However, variety in the definitions for frequent attendance and medically unexplained symptoms across published studies makes meaningful comparisons between them questionable, and after controlling for age and gender the odds of RRCs being frequent attenders reduces, suggesting that the age and gender profiles of RRCs influence frequent attender rate. We must also take into account that the RRC definition is based on recurrent consultations, making frequent attendance a self-fulfilling feature of RRC, although for this reason we removed musculoskeletal consultations from the definition of frequent attendance.

A third (31–35%) of RRCs are frequent attenders (top 10%). This might be higher than research predicts (Smits et al. 2009, Reid et al. 2001b), but the profile of frequent attenders identified in the CiPCA database is different from that of RRCs, with frequent attenders having an exaggerated version of the RRC profile. Where RRCs are older, more likely to be female, and have more consultations and more recorded somatic symptoms than controls, frequent attenders are even older, more likely to be female, and have higher numbers of consultations and recorded somatic symptoms than RRCs (mean 3.4 in frequent attenders versus 2.8-2.9 for RRCs). We can conclude, therefore, that the proportion of RRCs who are frequent attenders supports the argument that RRCs fit the construct for CWP. The number of RRCs who are also frequent attenders might be higher than that expected in CWP patients, but perhaps it is not unexpected in this subgroup of CWP. The RRC definition specifically identifies frequent attenders with musculoskeletal symptoms whom we consider to be unrecognised as having CWP. The implication is that since their condition is unrecognised they have an unmet need which drives repeated consultations. Moreover, the profile of RRCs is not the same as that of frequent attenders and only a third of RRCs are frequent attenders, suggesting that the definition is not simply identifying frequent attenders with musculoskeletal symptoms – a situation where we would expect the profile of RRCs to more closely match that of frequent attenders, and more RRCs to be frequent attenders.

5.5.5 Generalised pain

a. Non-specific generalised pain

Approximately 25% of RRCs were also recorded as consulting for non-specific generalised pain and this was similar between case definitions.

The proportion of non-specific generalised consulters who were also identified as RRCs varied from 14% to 33% by case group definition. This suggests that the non-specific pain codes identified in the previous chapter show a reasonable degree of overlap with RRCs and therefore supports the use of non-specific generalised pain coding as a rough measure of recognised CWP.

If we add patients with recognised CWP, measured using non-specific generalised pain coding (identified in Chapter Four), to those with unrecognised CWP, measured using RRCs without non-specific pain coding, we obtain prevalences ranging from 1,000 to 1,400 per 10,000 by case group definition. These figures are much higher than we would expect given community prevalence (1,077 per 10,000 population) figures for CWP (established in Chapter Three). This might mean that either high numbers of RRCs or high numbers of patients coded with generalised pain are not CWP patients based on strict ACR criteria.

The overlap between recognised (non-specific pain coding) and unrecognised CWP (RRCs without a generalised pain code) will be explored in more detail in the next chapter.

b. Differential diagnoses

The percentage of RCCs recorded with differential diagnoses for CWP is low (8–9%), suggesting that the RRC definition is successfully identifying patients without alternative explanations for their symptoms. There is evidence that FM/CWP prevalence is higher in patients with some differential diagnoses (Ostuni et al. 2002, Wolfe et al. 2009), suggesting that a higher percentage of cases than controls with recorded alternative diagnoses also supports the CWP construct.

It might be argued that patients recorded with alternative explanations for their widespread pain symptoms should be specifically excluded in further iterations of the RRC definition. However, CWP/FM can coexist with its differentials (Wolfe et al. 2011b, Wolfe and Michaud 2004, Middleton et al. 1994, Iannuccelli et al. 2012, Aloush et al. 2007, Wolfe and Cathey 1983, Kato et al. 2006, Bazzichi et al. 2007). In fact thyroid autoimmunity has been postulated as a predisposition for fibromyalgia (Bazzichi et al. 2012), and it would therefore seem unwise to exclude such diagnoses from the RRC definition since a diagnosis with one of FM/CWP's differentials does not exclude concomitant FM/CWP.

None of these validations (prevalence estimates, age and gender distribution, recorded somatic symptoms, comorbidity, frequent attendance, and overlap with non-specific generalised pain and differential diagnosis coding) proves that RRCs would fulfil established CWP criteria, but taken as a whole they provide persuasive evidence that this group of patients appear to fit the 'characteristics' of someone with CWP.

5.5.6 Strengths and limitations

a. Study population

The existing Rohrbeck-2007 RRC criteria require a minimum of three years consultation data for case identification. In order to define a case, consultation patterns during a five-year window are examined. It could be argued that the five-year window for an individual should start with his or her first regional musculoskeletal consultation; however, for the purposes of this development study, a set timeframe from 2005 to 2009 was chosen for convenience.

It is possible that a patient could be wrongly identified as not being a RRC due to incomplete medical records. For example, a patient might consult for only one musculoskeletal complaint before moving house and re-registering with another, non-CiPCA, practice. It was decided

therefore to limit the study population to those fully registered with the CiPCA practices between 2005 and 2009. To ensure comparability of cases and controls, the control group was also selected from the fully registered population. Members of a more fluid and mobile population are likely to be systematically different from those remaining resident in a fixed place for at least five years. Limiting the study population to patients fully registered during a five-year period is therefore likely to introduce bias and reduce the generalisabilty of the study results. Generalisability may also be reduced by the geographical limitation of the CiPCA study to one area of the UK (North Staffordshire). The CiPCA population has already been demonstrated to be older than the UK general population (Table 4.1) and it is likely that other features may also be systematically different. However, differences in age and gender of the study population were accounted for by standardising prevalence figures to the UK general population (Table 5.4). The control group were also younger than the case groups and therefore subgroup analyses were done for case and controls aged 45 and over, and, when assessing differences in somatic symptom count and frequent attender status, age and gender were controlled for (Tables 5.9 and 5.12). European geographical variation in CWP prevalence was demonstrated to be limited in the systematic review presented in Chapter Three, so limiting the study geographically may only have a small influence on generalisability. In addition the CiPCA database has been demonstrated to give similar musculoskeletal consultation prevalence figures to a larger national general practice database (Jordan et al. 2007).

b. Ambiguous codes

Only regional musculoskeletal Read codes were included on code lists B (all regional musculoskeletal codes) and C (clinician defined regional musculoskeletal codes). Ambiguous codes with the potential to represent either regional or generalised problems (for example, codes simply labeled ‘arthralgia’ or ‘joint pain’ with no region specified) were excluded from the RRC-all and RRC-clinician code lists. However, the original Rohrbeck short code list (Rohrbeck et al. 2007) included 16 ambiguous or generalised codes (see appendix A5.1, Table A5.2 for ambiguous codes). Despite this, the RRC-Rohrbeck code lists did not identify any patients who were not identified by the other two RRC definitions. This research aimed to identify unrecognised CWP consulters. Ambiguous codes were therefore excluded to ensure that RRC criteria identified patients on the basis of their consultation patterns for regional (not generalised) complaints only.

The results of a sensitivity analysis (see appendix A5.6) investigating the impact of including ambiguous codes revealed only a very limited increase in RRC-all and RRC-clinician prevalence when ambiguous codes were included, suggesting that the ambiguous codes are used infrequently and their exclusion had little effect.

c. Clinician defined codes

As previous discussed (section 4.5.6.d) the clinician-defined codes were arrived at through discussion with a limited and select group of clinicians. To account for the diversity between clinicians the decision was made to exclude only codes agreed by all panel members to be unlikely to represent CWP. The alternative would have been to include only those codes on which there was unanimity, which would have resulted in a short list of codes excluding many likely to be in use. The clinician defined code list is therefore a large and inclusive list that will accommodate heterogeneous coding practices and diagnostic beliefs.

d. Control group

Membership of the control group was defined by patients consulting for pain in only one of three body regions in a five-year period. It does not therefore exclude individuals experiencing pain in more than one area. However, since the hypothesis being tested is that RRCs would be likely to fit established criteria for CWP, the control group was selected in order to compare patients who *consult* for pain in one body region versus those who *consult* for pain in multiple body regions.

e. Prevalence figures

While possibly missing short term CWP cases, the RRC definition arguably identifies a group of individuals with greater clinical need, since the need for consultations in at least three of the five years required for RRC status will identify those with truly chronic musculoskeletal pain who are repeatedly consulting for help with their pain symptoms.

f. Comorbidity

This study used non-musculoskeletal consultation count and consultation by Read-code chapter as a measure of comorbidity rather than specific diseases. The use of coding by chapter provides a useful proxy for establishing the extent of illness by diagnostic classification and the use of consultation count provides an indication of illness burden. However, both these measures are strongly influenced by illness and consulting behaviour (Sensky et al. 1996), and clinicians'

diagnostic and coding practices (Fink et al. 1999), and are therefore not absolute measures of comorbidity.

g. Somatic symptoms

The list of symptoms (itemised in the ACR-2010 criteria, Wolfe et al. 2010) that were used to identify Read codes for the study is not an exhaustive list of all somatic symptoms. The measure shares the problems associated with using any type of morbidity coding as a proxy for community burden. It relies on patients' consulting practices and clinicians' diagnostic beliefs and coding practices. The somatic symptom count used in this study is therefore only used as an indicator of the relative burden of somatic symptoms in cases versus that in controls.

h. Frequent attenders

Previous studies have used a diversity of approaches to defining frequent attenders (Gill et al. 1999). The majority of studies have defined frequent attenders using either a minimum number of consultations in a defined timeframe (e.g. 9–14 per year), or a more relative approach (e.g. top 10–25% of attenders) (Vedsted et al. 2005, Gill et al. 1999). Given conflicting recommendations for frequent attender definition, this study defined frequent attenders using two approaches (the top 5% and 10% of consulters), which showed similar conclusions.

i. Generalised pain

Care should be taken with the measure for non-specific generalised pain used in this study. It does not represent CWP known to be recognised by their GP, but represents patients coded with pain conditions that could fit CWP criteria or could fit alternative differential diagnoses for CWP/FM. Consequently, it is likely to include patients recognised by their GP as having CWP, in addition to a number of false positives. It is therefore likely to overestimate recognised CWP in primary care.

The list of possible differential diagnoses used in this study is not exhaustive. Morbidity coding relies on consulting behaviour, and on diagnostic and coding practices. The measure for differential diagnoses should be used as a relative measure to compare the proportion of patients coded with selected differential diagnoses between cases and controls, rather than an absolute measure of disease prevalence.

5.6 Conclusions

The three definitions for RRC have identified groups of people who have similar characteristics and who appear to fit many of the recognised features of CWP, including identifying patients apparently unrecognised by GPs as having a generalised pain condition. However, consultation prevalence of RRC is perhaps higher than that expected based on published data, which may suggest not all these patients fulfil the stricter definitions of CWP.

There is little difference, other than prevalence, in the characteristics of the patients returned by the three code lists. This suggests that RRC-all, which uses a wider coding list, may be more sensitive without necessarily losing specificity. However, the RRC-all group identifies more patients with Chapter S (injury) codes. This difference is likely accounted for by more Chapter S codes in the RRC-all code list, but it might also be explained by more single limb injuries in the RRC-all group. The next chapter will therefore investigate the distribution of single limb versus dual upper and lower limb problems in each group of RRCs.

The RRC definition appears to pick up individuals that GPs are not identifying as having a generalised pain condition. The next chapter also investigates the difference between recognised and unrecognised CWP by exploring the overlap between being a RRC and recorded non-specific pain.

Chapter 6
Distribution of painful body regions and relationship to recognised generalised pain in primary care of RRCs

6.1 Aims and objectives

The overall aim of this chapter is to further investigate recurrent regional consulters (RRCs) identified using the three codes lists to: 1) provide further evidence for which code list(s) should be used in an updated version of the Rorhbeck-2007 RRC criteria; 2) start developing a severity scale for RRC; and 3) to investigate the intersection of recognised CWP in primary care (those with non-specific generalised pain labels) with unrecognised CWP to test the RRC definition as a means of identifying unrecognised CWP consulters.

The previous chapter showed that the patient groups returned by the three RRC definitions (RRC-all: identified using all regional musculoskeletal codes, RRC-clinician: identified using clinician defined regional musculoskeletal codes, RRC-Rohrbeck: defined using the original Rohrbeck short code list) appeared similar with similar overall levels of somatic symptoms, frequent attendance, non-musculoskeletal consultation rates, and comorbidity. Partly this reflects the fact that the RRC-Rohrbeck and RRC-clinician groups are both subgroups of the much larger RRC-all group of patients. The two things differentiating the three groups of RRCs were the number of patients identified (more codes identified more patients) and the slightly increased prevalence of Chapter S (injury and poisoning) coding in the RRC-all group. One explanation for the higher level of Chapter S coding is that there are more inury codes on the RRC-all code list. An excess of injury coding suggests the RRC-all group includes more patients with acute musculoskeletal injury and its sequelae. Since RRCs are defined as having a documented upper- or lower-limb complaint, if there is more acute injury in the RRC-all group we might expect there to be more patients with only one limb affected rather than both arm and leg complaints.

Objective 1: To determine if the RRC-all list identified a smaller proportion of people consulting for problems in all three (axial and upper- and lower-limb) body regions.

Epidemiological evidence suggests that FM and CWP exist on a continuum of idiopathic pain syndromes (Forseth and Gran 1993, Wolfe 1997, Macfarlane 1999) rather than as discrete disease entities. If this is the case we would expect a grading of severity from patients recorded as consulting for a single region complaint (our 'control' group), through two-region RRCs (recorded with axial and either upper- or lower-limb complaints), to three-region RRCs (recorded with axial and both upper- and lower-limb complaints). Further, we saw in the previous chapter that RRC prevalence is higher than estimates of CWP community prevalence. If CWP exists on a spectrum, the RRC definition has the potential to identify both patients fitting established CWP criteria (requiring all three regions) and patients who may not necessarily fit ACR-90 criteria, but who experience a level of 'fibromyalgianess' or polysymptomatic distress (Wolfe 2009c).

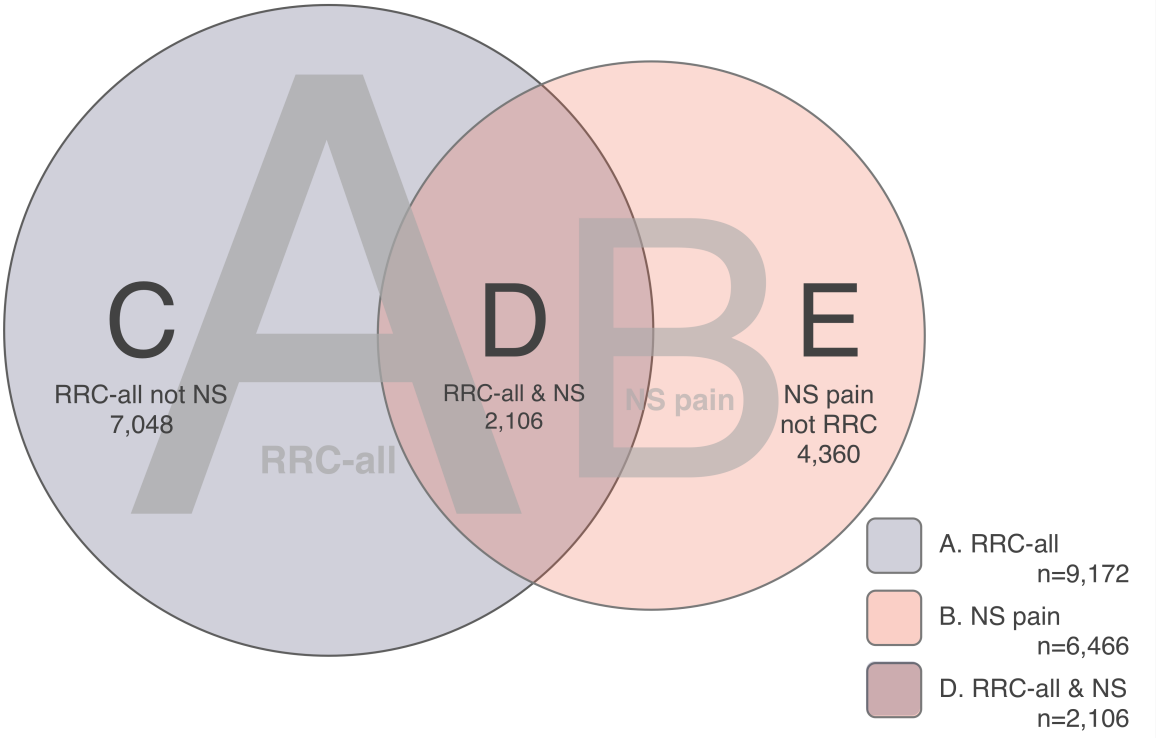
Objective 2: To investigate whether a grading of severity exists by comparing the rate of somatic symptoms, consultation and frequent attendance in two- and three-region RRCs.

In the previous chapter we showed that a third of patients recorded with non-specific generalised pain codes were also RRCs (see Figure 6.1). If we consider patients recorded with non-specific generalised pain codes as having a recognised widespread pain condition in primary care, then investigating the overlap between RRCs and those recorded with non-specific pain complaints offers insights into the differences between recognised and unrecognised CWP in primary care. This allows assessment of whether unrecognised CWP consulters have a less 'severe' condition or whether they are a group with similar characteristics to CWP patients fitting established criteria who have been missed by GPs.

Objective 3: To determine how similar recognised (patients with non-specific pain coded consultation) and unrecognised (RRCs without non-specific pain coded consultation) CWP consulters are on characteristics of CWP.

Objective three was addressed by comparing the age, gender, number of recorded body regions (two or three), number of recorded somatic symptoms, and consultation and frequent attender rates between those only fulfilling the RRC definition ('unrecognised' CWP, area C in Figure 6.1), those who had a non-specific pain code but did not fulfill the RRC definition (area E in Figure 6.1), and those who fulfilled the RRC definition and had a non-specific pain code in their primary care record (area D in Figure 6.1).

Figure 6.1. Venn diagram to show the overlap between non-specific generalised pain code recording and RRC-all.



A. RRC-all (blue circle, A = C + D)
B. Non-specific pain (red square, B = D + E)
C. RRC-all patients not recorded with non-specific pain codes (blue circle not overlapping with red circle, C = A - D)
D. RRC-all and non-specific pain (intersection of red and blue circles, D = A ∩ B)
E. Non-specific pain not RRC-all (red circle not overlapping with blue circle, E = B - D)

Objective 4: The final objective was to refine the estimate of CWP in primary care using both the RRC criteria and non-specific generalised pain coding to investigate how much consultation-defined measures might over- or under-estimate CWP.

6.2 Methods

As described in section 5.3.1, RRCs were identified from all patients fully registered (no age restrictions) with the CiPCA practices between 2005 and 2009 using the Rohrbeck-2007 criteria and the following three lists of regional musculoskeletal Read codes:

1. **RRC-all:** all regional musculoskeletal Read codes (documented in appendix A5.2).
2. **RRC-clinician:** excluding from the list of all regional musculoskeletal Read codes those felt by clinicians to be unlikely to be used for CWP patients (documented in appendix A5.2).
3. **RRC-Rohrbeck:** Rohrbeck's (2007) original short code list (documented in appendix A5.1).

6.2.1 Number of body regions

Objective 1: To determine if the RRC-all list identified a smaller proportion of people consulting for problems in all three (axial and upper- and lower-limb) body regions.

The percentage of patients recorded with complaints in only two of three body regions (recorded with axial plus upper- or lower-limb codes) rather than problems in all three body regions (recorded with axial plus upper- and lower-limb codes) was determined for each of the three groups of RRCs (RRC-all, RRC-clinician, RRC-Rohrbeck). The RRC-all group includes all people returned by the RRC-Rohrbeck criteria. In order to assess if the extra people returned by the RRC-all criteria differed from those identified using the RRC-Rohrbeck criteria, those identified by the RRC-Rohrbeck criteria were excluded from the RRC-all group for this analysis. Differences in the distribution of recorded body regions between the RRC-Rohrbeck group and the extra patients returned by the RRC-all criteria were tested using the chi-squared test.

6.2.2 Comparison of two- and three-region RRCs

Objective 2: To investigate whether a grading of severity exists by comparing the rate of somatic symptoms, consultation and frequent attendance in two- and three-region RRCs.

For this objective we present methods and results solely for the RRC-all group. Similar analyses were performed for the other two RRC groups with similar results.

RRC-all patients were divided into two groups:

- **2-region RRC-all:** RRC-all patients recorded with codes during the five years for two body regions (axial + upper or lower limb).
- **3-region RRC-all:** RRC-all patients recorded with codes during the five years for three body regions (axial + upper and lower limb).

Controls were those identified previously (with a single region musculoskeletal problem – axial, upper limb or lower limb – during the five-year period (2005–2009)), see section 5.3.1. Controls were compared descriptively with the two- and three-region RRC-all groups on mean number of somatic symptoms, percentage who were non-musculoskeletal frequent attenders, and mean number of musculoskeletal and non-musculoskeletal consultations.

Somatic symptoms were calculated as described previously using 340 Read codes corresponding to 40 physical symptoms (see section 5.3.4, Read codes presented in appendix A5.3, Table A5.4). For each patient the number of somatic symptoms consulted for in the period 2005 to 2009 was calculated. Non-musculoskeletal frequent attenders were defined, as previously, as the top 10% of attenders in each practice for non-musculoskeletal problems. Non-musculoskeletal problems were defined as consultations coded with any Read code except those identified by Jordan et al. (2010) as being musculoskeletal in nature. The percentage who were non-musculoskeletal frequent attenders, and the mean number of musculoskeletal and non-musculoskeletal consultations between 2005 and 2009 was calculated for each group of patients.

Differences between two- and three-region RRCs were assessed using chi-squared tests to investigate differences in gender and frequent attendance, and with t-tests to investigate differences in mean age, somatic symptom count, and musculoskeletal and non-musculoskeletal consultation counts.

6.2.3 Non-specific generalised pain

Objective 3: To determine how similar recognised (with non-specific pain coded consultation) and unrecognised (RRCs without non-specific pain coded consultation) CWP consulters are on characteristics of CWP.

Non-specific pain consulters were identified using 108 non-specific pain (including osteoarthritis) codes with the potential to represent CWP detailed in Chapter Four (section 4.3.2, codes listed in appendix A4.1, Table A4.5). Patients were identified from those fully registered with the CiPCA practices beween 2005 and 2009 (these are the same non-specific pain consulters as those identified in Chapters Four and Five).

Age and gender were compared across the RRC groups, controls and non-specific pain consulters. For the rest of this objective we present methods and results solely for the RRC-all group. Similar analyses were performed for the other two RRC groups, with similar results.

a. Overlap between RRC and non-specific pain coding

To explore the overlap between recognised CWP consulters and unrecognised CWP consulters, the intersection between patients recorded with non-specific pain codes (recognised CWP) and those identified as RRC-all (unrecognised CWP) was investigated.

The two main groups of patients (A. RRC-all and B. non-specific pain consulters) were compared with the following three subgroups (see Figure 6.1):

1. RRC-all patients excluding any recorded with non-specific pain codes (C. unrecognised RRCs).
2. Patients identified as both RRC-all and recorded with a non-specific pain code (D. recognised RRCs).
3. Patients recorded with non-specific pain codes excluding those also identified as RRC-all (E).

The five patient groups and subgroups (illustrated in Figure 6.1) were compared descriptively on mean age, gender distribution, mean number of somatic symptoms, proportion who were non-musculoskeletal frequent attenders, and mean number of musculoskeletal and non-musculoskeletal consultations.

Somatic symptom count, non-musculoskeletal frequent attendance, and consultation rates (musculoskeletal and non-musculoskeletal) were evaluated using the same measures as detailed in section 6.3.2.

To test for differences between the three subgroups (C: RRC-all not NS; D: RRC-all also NS; and E: NS not RRC-all) unadjusted and adjusted odds ratios for age group, gender, frequent attender status (top 10% of attenders for non-musculoskeletal complaints), recording of one or more somatic symptoms and recording of three body regions (axial, upper limb and lower limb) were calculated using multinomial logistic regression with NS/RRC subgroup as the dependent variable using SPSS (IBM 2011). Group E (NS not RRC-all) was used as the reference category. Age group was defined using the following age bands 14 and under; 15–24; 25–44; 45–64; 65–74; and 75+. Working age adults (25–44) constituted the reference category.

b. Non-specific generalised pain and two- and three-region RRCs

The RRCs subgroups (C: RRC-all not NS; and D: RRC-all and NS) will have been recorded with either two or three body regions, while subgroup E (NS not RRC-all, reference category) will have been recorded with between zero to three body regions. Therefore, the percentages of two- and three-region RRCs in groups C (RRC-all not NS, unrecognised RRCs) and D (RRC-all and NS, recognised RRCs) were calculated and compared further. A chi-squared test was used to investigate the association between additional recording of non-specific pain codes and number of body regions recorded in RRCs.

6.2.4. CWP coding prevalence

Objective 4: To refine the estimate of CWP in primary care using both the RRC criteria and non-specific generalised pain coding to investigate how much consultation-defined measures might over- or under-estimate CWP.

A comparison was made between the community prevalence of CWP, the expected consultation prevalence of CWP, and the combined coding prevalence of RRCs and non-specific pain consulters. The meta-analysis, detailed in Chapter Three, provided the pooled community prevalence figure (1,077/10,000). Expected consulting prevalence for CWP was calculated using this estimated community prevalence and the CWP consultation rate observed in a study conducted by Macfarlane et al. (1999). The results of a postal survey of the general population (patients registered with one general practice in a Manchester suburb) aged 18 to 65 (n=1,953) suggested that approximately 72% of CWP patients (n=181) reporting consulting for their pain at any time. This gives an expected consultation prevalence of 775 per 10,000.

If RRCs offer a measure of unrecognised CWP and non-specific generalised pain coding offers a measure of recognised CWP, then a combination of the two offers a measure of overall CWP consulting. We identified all those fulfilling RRC criteria and/or recorded with non-specific pain codes (non-specific generalised pain including osteoarthritis, see section 4..4.1) over the five-year period (2005–2009) to determine a combined measure of CWP consulting (number of patients recorded with a non-specific generalised pain code and/or fulfiling the RRC criteria during the five years). Prevalence was calculated per 10,000 population using the number of patients fully registered with the CiPCA practices between 2005 and 2009 as the denominator. This figure was compared with the expected point consulting prevalence of CWP of 775 per 10,000.

To test the impact of excluding differential diagnoses, coding prevalence was further calculated excluding those patients also recorded with one or more specified alternative diagnoses. Patients recorded with alternative diagnoses were identified using the methods outlined in Chapter Five (section 5.3.5.b).

6.3 Results

6.3.1 Number of body regions

Objective 1: To determine if the RRC-all list identified a smaller proportion of people consulting for problems in all three (axial and upper- and lower-limb) body regions.

The RRC-all group had a higher proportion of patients recorded with problems in only two regions (axial plus upper- or lower-limb, 54%) than the RRC-Rohrbeck group (45%) (Table 6.1).

Table 6.1 Distribution of body regions affected in each group of cases. Data are numbers (%).

	2-region	3-region	
	Axial + one of upper or lower limb coding	**Axial + upper and lower limb coding**	**Total**
RRC-all	4,991 (54%)	4,181 (46%)	**9,172**
RRC-clinician	3,800 (52%)	3,507 (48%)	**7,307**
RRC-Rohrbeck	1,577 (45%)	1,946 (55%)	**3,523**

Examining the additional cases identified by the RRC-all definition compared to the original RRC-Rohrbeck group (Table 6.2) there were a significantly higher percentage of two-region consulters in the RRC-all patients not identified by the RRC-Rohrbeck definition compared to those identified by the RRC-Rohrbeck criteria ($\chi^2(1) = 214.86$, $p<0.001$, OR = 1.89, 95% CI 1.73, 2.05).

Table 6.2 Distribution of body regions affected in RRC-Rohrbeck compared to the RRC-all group excluding those identified using the RRC-Rohrbeck definition. Data are numbers (%).

	2-region	3-region	
	Axial + one of upper or lower limb coding	**Axial + upper and lower limb coding**	**Total**
RRC-Rohrbeck	1,577 (45%)	1,946 (55%)	**3,523**
RRC-all not RRC-Rohrbeck	3,414 (60%)	2,235 (40%)	**5,649**

6.3.2 Comparison of two- and three-region RRCs

Objective 2: To investigate whether a grading of severity exists by comparing the rate of somatic symptoms, consultation and frequent attendance in two- and three-region RRCs.

There was an increase in age, number of somatic symptoms, consultation count, and percentage who were frequent attenders from controls, through two-region RRCs to three-region RRCs (Table 6.3). The proportion of women was similar for both groups of RRCs (χ^2 (1) = 0.54, p=0.46) and higher than that observed in the control group. A similar pattern was observed in the RRC-clinician and RRC-Rohrbeck groups (results presented in appendix A6.1, Table A6.1).

The percentage who were frequent attenders was significantly higher in the three-region compared to the two-region RRC group (35% vs 28%; χ^2 (1) = 56.11, p<0.001). There were significant differences in mean age (57 vs 59; t (9170) = -6.00, p<0.001), somatic symptom count (2.61 vs 2.92; t (9170) = -6.82, p<0.001), musculoskeletal (9 vs 11; t (9170) = -17.53, p<0.001) and non-musculoskeletal (37 vs 42; t (9170) = -9.87, p<0.001) consultation counts between two- and three-region RRCs.

Table 6.3 Comparison of 2- and 3-region RRC-all patients and controls on age, gender, recorded somatic symptoms, MS and non-MS consultation count and percentage who are in the top 10% of attenders (non-MS consultations only).

Patient group	Mean age (sd)	% female	Mean somatic symptom count (sd)	Mean non-MS consultation count (sd)	Mean MS consultation count (sd)	% FAs	Total
3-region RRC-all	59 (16)	60%	2.92 (2.20)	42 (27)	11 (7)	35%	**4,181**
2-region RRC-all	57 (18)	61%	2.61 (2.05)	37 (24)	9 (6)	28%	**4,991**
Control	46 (21)	50%	1.22 (1.35)	20 (17)	2 (2)	7%	**20,499**

MS: musculoskeletal
FA: Top 10% non-musculoskeletal frequent attender

6.3.3 Non-specific generalised pain

Objective 3: To determine how similar recognised (with non-specific pain coded consultation) and unrecognised (RRCs without non-specific pain coded consultation) CWP consulters are on characteristics of CWP.

a. Demographics of recognised and unrecognised CWP coding

The age and gender distribution for the three RRC groups, non-specific generalised pain consulters, and controls are shown in Table 6.4. All three groups of RRCs showed a similar age and gender distribution, with more women and more affected in the 45–64 year age group. Non-specific pain coding was also higher in women and increased with age for those recorded with generalised osteoarthritis and all generalised pain codes including osteoarthritis; however for the FM and all generalised pain excluding osteoarthritis groups, there was a peak in the 45–64 year age groups. In contrast to RRCs and non-specific pain consulters, the number of men and women in the control group was almost equal and there was a peak in the 25–44 year age group.

Table 6.4 Age and sex distribution of RRCs and controls, and non-specific pain consulters (2005–2009, as defined in Chapter Four).

	Number (%)							
	RRCs			Control	Non-specific generalised pain consulters (as defined in Chapter 4)			
Variable	RRC-all	RRC-clinician	RRC-Rohrbeck		FM	Generalised OA	All generalised pain (exc. OA)	All generalised pain
Age group								
<14	39 (0.4)	21 (0.3)	5 (0.1)	1,346 (6.6)	1 (0.3)	0 (0.0)	125 (2.5)	125 (1.9)
15–24	304 (3.3)	149 (2.0)	55 (1.6)	2,467 (12.0)	6 (2.1)	0 (0.0)	261 (5.1)	261 (4.0)
25–44	1,639 (17.9)	1,157 (15.8)	454 (12.9)	5,709 (27.9)	81 (27.9)	27 (1.5)	1,070 (21.0)	1,090 (16.9)
45–64	3,652 (39.8)	3,005 (41.1)	1,452 (41.2)	6,564 (32.0)	168 (57.9)	597 (34.0)	2,166 (42.6)	2,635 (40.8)
65–74	1,793 (19.5)	1,537 (21.0)	775 (22.0)	2,411 (11.8)	27 (9.3)	566 (32.2)	882 (17.3)	1,315 (20.3)
>75	1,745 (19.0)	1,438 (19.7)	782 (22.2)	2,002 (9.8)	7 (2.4)	566 (32.2)	585 (11.5)	1,040 (16.1)
Total	9,172	7,307	3,523	20,499	290	1,756	5,089	6,466
Gender								
Female	5,522 (60)	4,460 (61)	2,262 (64)	10,215 (50)	255 (88)	1,255 (72)	3,329 (65)	4,299 (67)
Male	3,650 (40)	2,847 (39)	1,261 (36)	10,284 (50)	35 (12)	501 (28)	1,760 (35)	2,167 (33)
Male: female ratio	0.66	0.64	0.56	1.01	0.14	0.40	0.53	0.50

b. Overlap between RRC and non-specific pain coding

As shown in Chapter Five, RRC-all patients accounted for 33% of all patients recorded with a non-specific generalised pain code during the same time period, while non-specific generalised pain consulters represented 23% of RRC-all patients. A comparison of the two index patient groups (A. RRC-all and B. non-specific generalised pain consulters) with the three subgroups representing their overlap (C. RRC-all not NS, D. RRC-all and NS, E. NS not RRC-all) is presented in Table 6.5. Similar results were found in the overlap between non-specific pain consulters and the remaining two RRC groups (RRC-clinician and RRC-Rohrbeck), these are presented in appendix A6.2 (Tables A6.2 and A6.3).

Table 6.5 Comparison of RRC-all and patients recorded with non-specific pain.

Patient group	Mean age (sd)	% female	% FAs	Somatic symptom count		Consultation count				Total
						Non-MS		*MS*		
				Mean (sd)	Median (IQR)	Mean (sd)	Median (IQR)	Mean (sd)	Median (IQR)	
A. RRC-all	58 (17)	60%	31%	2.8 (2.1)	2 (1, 4)	39 (26)	35 (21, 51)	10 (6)	8 (6, 12)	**9,172**
B. NS	60 (18)	67%	27%	2.4 (2.1)	2 (1, 3)	37 (25)	32 (19, 48)	8 (7)	6 (3, 11)	**6,466**
C. RRC-all not NS	57 (17)	57%	28%	2.5 (2.0)	2 (1, 4)	37 (25)	32 (19, 49)	9 (5)	7 (5, 11)	**7,066**
D. RRC-all also NS	63 (15)	71%	43%	3.5 (2.4)	3 (2, 5)	47 (28)	42 (29, 60)	14 (8)	12 (9, 17)	**2,106**
E. NS not RRC-all	58 (19)	64%	19%	1.9 (1.8)	2 (1, 3)	31 (21)	28 (16, 42)	6 (5)	4 (2, 7)	**4,360**

sd: standard deviation
IQR: Interquartile range
NS: non-specific pain consulter (including OA)
MS: musculoskeletal
FA: Top 10% non-musculoskeletal frequent attender

Recognised versus unrecognised CWP consulters

Comparing unrecognised CWP consulters (C. RRC-all not NS) with recognised CWP consulters (B. patients recorded with non-specific generalised pain codes), we see that unrecognised CWP consulters (C) were younger and more likely to be male, but comprise a similar percentage who were frequent attenders, and have similar numbers of somatic symptoms, musculoskeletal consultation counts and rates of non-musculoskeletal consultation.

Recognised RRCs versus unrecognised RRCs

Comparing unrecognised RRCs (C. RRC-all patients not recorded with non-specific pain codes) with recognised RRCs (D. RRC-all patients recorded with non-specific pain codes), unrecognised RRCs (C) are younger, more likely to be male, less likely to be frequent attenders, and have fewer recorded somatic symptoms, musculoskeletal and non-musculoskeletal consultation counts.

RRCs versus recognised CWP consulters who are not RRCs

Results of a multinomial logistic regression analysis comparing group C (RRC-all not NS) and D (RRC-all and NS) with group E (NS not RRC-all) as the reference category are shown in Table 6.6.

Recognised (D. RRC and NS) and unrecognised (C. RRC not NS) RRCs were more likely to be frequent attenders, to have at least one recorded somatic symptom and to be recorded with codes for all three body regions than recognised CWP consulters not identified as RRCs (E. NS not RRC). Recognised RRCs (D. NS and RRC) were more likely to be female (OR = 1.20, 95% CI 1.06, 1.35) and older than recognised CWP consulters who were not RRCs (E. NS not RRC), while unrecognised RRCs (C. RRC not NS) were more likely to be male (OR = 0.70, 95% CI 0.64, 0.76) and of working age.

Table 6.6 Multinomial logistic regression analysis comparing groups C (RRC-all not NS) and D (RRC-all also NS) with group E (NS not RRC-all) as the reference category – adjusted and unadjusted odds ratios.

		Reference group E. NS not RRC	C. RRC not NS			D. NS and RRC		
		n (%)	n (%)	Unadjusted OR (95% CI)	Adjusted OR (95% CI)	n (%)	Unadjusted OR (95% CI)	Adjusted OR (95% CI)
Gender	**Female**	2,803 (64%)	4,026 (57%)	0.74 (0.68, 0.80)	0.70 (0.64, 0.76)	1,496 (71%)	1.36 (1.22, 1.53)	1.20 (1.06, 1.35)
	Male	1,557 (36%)	3,040 (43%)	1	1	610 (29%)	1	1
FA status	**Yes**	843 (19%)	1,954 (28%)	1.60 (1.46, 1.75)	1.38 (1.25, 1.54)	914 (43%)	3.20 (2.85, 3.59)	2.23 (1.96, 2.53)
	No	3517 (81%)	5,112 (72%)	1	1	1,192 (57%)	1	1
Somatic symptoms	**Yes**	3,387 (78%)	6,121 (87%)	1.86 (1.69, 2.05)	1.67 (1.49, 1.87)	1,983 (94%)	4.63 (3.81, 5,63)	3.30 (2.69, 4.06)
	No	973 (22%)	945 (13%)	1	1	123 (6%)	1	1
Age group	**<14**	79 (2%)	36 (1%)	0.23 (0.15, 0.35)	0.28 (0.18, 0.44)	3 (0%)	0.12 (0.04, 0.38)	0.18 (0.05, 0.57)
	15–24	208 (5%)	278 (4%)	0.68 (0.55, 0.83)	0.76 (0.61, 0.95)	26 (1%)	0.39 (0.25, 0.61)	0.49 (0.31, 0.76)
	25–44	715 (16%)	1,411 (20%)	1	1	228 (11%)	1	1
	45–64	1,633 (37%)	2,834 (40%)	0.88 (0.79, 0.98)	0.80 (0.71, 0.90)	818 (39%)	1.57 (1.32, 1.86)	1.45 (1.21, 1.73)
	65–74	861 (20%)	1,259 (18%)	0.74 (0.65, 0.84)	0.64 (0.55, 0.73)	534 (25%)	1.95 (1.62, 2.34)	1.60 (1.32, 1.95)
	75+	864 (20%)	1,248 (18%)	0.73 (0.65, 0.83)	0.64 (0.56, 0.74)	497 (24%)	1.80 (1.50, 2.17)	1.36 (1.11, 1.65)
3-region consulters	**Yes**	162 (4%)	3,102 (44%)	20 (17, 24)	20 (17, 25)	1,079 (51%)	27 (23, 32)	25 (20, 33)
	No	4,198 (96%)	3,964 (56%)	1	1	1,027 (49%)	1	1

FA: Top 10% non-musculoskeletal frequent attender

3-region consulters: Individuals recorded with axial, upper and lower limb Read codes in the five years since baseline.

Adjusted for all presented variables.

c. Non-specific generalised pain and two- and three-region RRCs

The distribution of two- and three-region RRCs is shown in Table 6.7. Of the 33% of RRC-all patients (n=2,106) also recorded with non-specific pain codes (D. RRC-all and NS, recognised widespread pain) 49% consulted for only two of the three body regions. While for RRCs not recorded with non-specific pain codes (C. RRC-all not NS, unrecognised widespread pain, n=7,066) a slightly higher percentage (56%) were recorded as consulting for complaints in only two body regions. In RRCs there was a small but significant association between additional non-specific pain coding and whether RRCs were recorded with two or three body regions ($\chi^2(1) = 35.18$, $p<0.001$, OR = 1.3, 95% CI 1.2, 1.5).

Table 6.7 Number (%) of 2- and 3-region RRCs in groups C (RRC-all not NS) and D (RRC-all also NS).

Patient group (identified from fully registered patients in CiPCA population 2005-2009)	***RRC-all-2*** ***Axial + one of upper or lower limb coding***	***RRC-all-3*** ***Axial + upper and lower limb coding***	**Total**
C. RRC-all not NS	3,964 (56%)	3,102 (44%)	**7,066**
D. RRC-all also NS	1,027 (49%)	1,079 (51%)	**2,106**

NS: non-specific pain consulter (including OA)

6.3.4 CWP coding prevalence

Objective 4: To refine the estimate of CWP in primary care using both the RRC criteria and non-specific generalised pain coding to investigate how much consultation-defined measures might over- or under-estimate CWP.

Table 6.8 displays recorded consultation, community and expected consultation prevalence figures for CWP.

The consultation prevalence figures for RRC-all (1,149 per 10,000 population) and RRC-clinician (916/10,000) derived in Chapter Five are similar to that for estimated community prevalence (1,077 per 10,000 population). RRC-all and RRC-clinician prevalence estimates are higher than expected consulting prevalence (775/10,000). RRC-Rohrbeck prevalence (442/10,000) is much lower than the community (1,077 per 10,000 population) or expected consulting prevalence (775/10,000).

Combining RRCs (unrecognised CWP) with non-specific pain consulters (recognised CWP) we see prevalence ranging from 1,019 to 1,432 per 10,000 population, depending on the code list used to define RRCs; this is a narrower spread than figures based on RRCs alone. Prevalence of RRC-all or non-specific pain (1,432/10,000) is higher than community prevalence (1,077/10,000), while the related estimates based on the other two RRC definitions (RRC-Rohrbeck and RRC-clinician) are similar to the community CWP prevalence.

Removing differential diagnoses gives prevalence figures ranging from 921 to 1,318 per 10,000 of the population depending on the code list used to determine RRC status. These figures are still higher than the expected CWP consultation rate (775 per 10,000 population) but are similar to community prevalence (1,077/10,000).

Table 6.8 Five-year CWP coding, and annual community and consulting prevalence figures (per 10,000 population).

		Patient group	n	Prevalence per 10,000 population (95% CI)
Recorded prevalence	RRC	RRC-all	9,172	1,149 (1,127, 1,171)
		RRC-clinician	7,307	916 (896, 936)
		RRC-Rohrbeck	3,523	442 (428, 456)
	RRCs + NS consulters	RRC-all + NS pain	11,426	1,432 (1,408, 1,456)
		RRC-clinician + NS pain	10,167	1,274 (1,251, 1,297)
		RRC-Rohrbeck + NS pain	8,131	1,019 (998, 1,040)
	RRCs + NS consulters and excluding alternative diagnoses	RRC-all + NS pain excluding patients with DDx	10,520	1,318 (1,295, 1,342)
		RRC-clinician + NS pain excluding patients with DDx	9,311	1,167 (1,145, 1,189)
		RRC-Rohrbeck + NS pain excluding DDx	7,347	921 (901, 941)
Community prevalence*		CWP - using ACR-90 criteria in adults only		1,077 (907, 1,249)
Consulting prevalence		CWP patients expected to consult for pain symptoms = 72% of community prevalence (from Macfarlane et al. 1999)		775

NS = Non-specific pain coding
DDx = specific differential diagnoses
*Community prevalence: Results from meta-analysis presented in Chapter Three (excluding those scoring a moderate or high risk of bias on domains 1 or 4 of the QUIPS methodological quality tool).

6.4 Discussion

A comparison of the three groups of RRCs on number of recorded body regions showed the RRC-all group had a lower proportion of patients consulting in all three body regions (axial, upper and lower limb) compared to the other two RRC groups.

There is a disparity between expected annual CWP consulting prevalence (775/10,000) and the recorded five-year combined prevalence of non-specific pain and RRCs (RRC-all: 1,432/10,000 RRC-clinician:1,274/10,000 RRC-Rohrbeck:1,019/10,000). If we consider non-specific pain coding to represent recognised CWP, and RRCs (RRC-all) to represent unrecognised CWP, then the prevalence of the combination (1,432 per 10,000) of these two groups is higher than estimated community point prevalence of CWP of 1,077 per 10,000 (identified in Chapter Three). When patients recorded with differential diagnoses are removed, coding prevalence figures remain higher (1,318 per 10,000) than we would anticipate from the general population prevalence of CWP. This suggests that one or both groups (RRCs and non-specific pain) are identifying patients who do not fit established CWP criteria (e.g. ACR-90) at the end of the five-year period.

The RRC-all definition identified 33% (n=2,106) of recognised generalised pain consulters. Based on differences in mean somatic symptoms, frequent attendance and consultations rates, there appeared to be an increasing order of severity when moving from recognised CWP who did not fulfil the RRC definition (group E. NS not RRC), through to RRCs with unrecognised CWP (group C. RRC no NS), and finally to recognised RRCs (group D. RRC and NS). However, unrecognised RRCs (i.e. without a recorded non-specific generalised pain code) were more likely to be male and of working age.

6.4.1 Two- and three-region RRCs

The two notable differences between the three RRC groups identified in Chapter Five were: 1. a higher proportion of Chapter S (injury and poisoning) coding in the RRC-all group, and 2. the number of patients identified: more codes identified more patients.

An excess of injury (Chapter S) coding suggests that the RRC-all group includes more patients with acute musculoskeletal injury and its sequelae than the other two RRC groups; hence, we might expect there to be more patients with only one limb affected rather than both arm and leg complaints. Compared to the other two groups of RRCs, the RRC-all group did indeed have a higher proportion of patients recorded with single limb problems (two body regions: axial + upper or lower limb).

Our study showed increases in the number of somatic symptoms, consultation rate, and frequent attender rate when moving from controls, through 2-region RRCs to 3-region RRCs. This finding is consistent with the concept that FM and CWP exist within a spectrum of chronic idiopathic pain syndromes (Forseth and Gran 1993, Wolfe 1997, Macfarlane 1999). It could be argued that the more stringent three-region RRC definition identifies patients better fitting the CWP construct. Two-region RRCs have a profile suggesting less distress (fewer consultations, fewer symptoms) than three-region RRCs, but they are more similar to three-region RRCs than they are to controls. This suggests a grading of severity when moving from those recorded with single region musculoskeletal problems to those recurrently consulting for multi-site musculoskeletal pain.

The RRC-Rohrbeck group had a slightly higher percentage of 3-region RRCs (axial + upper limb + lower limb) which corresponds with the ACR-90 requirement for problems in both upper and lower limbs. It could be argued therefore that the RRC-Rohrbeck code list captures patients slightly more likely to fit ACR-90 CWP criteria. However, the updated ACR-2010 criteria emphasises a continuum of polysymptomatic distress (Wolfe et al. 2011a, 2013) and research suggests that pain exists on a continuum from localised to widepsread pain (Kamaleri et al. 2008a), implying that, even if two-region RRCs do not meet ACR-90 criteria for CWP, given poor consultation-based health in RRCs, they are still likely to sit at the more severe end of the spectrum of polysymptomatic distess.

6.4.2 Non-specific generalised pain

Our study showed the age and gender distribution of RRCs and non-specific pain consulters to be more similar to each other than to that observed in single-site controls. We have already shown (Chapter Five) that RRCs have many of the same features as CWP. In addition, patients recorded with non-specific pain codes have been shown to be more similar to RRCs than controls on somatic symptom count, consultation rate, and percentage of frequent attenders (Table 6.5 and Chapter Five). This suggests non-specific pain codes are being used for a group of patients sharing a similar profile to both RRC and community CWP patients. This supports the idea that non-specific pain coding represents recognised CWP.

However, there is a disparity between the combined recorded prevalence of recognised (non-specific pain) and unrecognised (RRC) CWP in primary care, and the expected CWP consulting prevalence, even when differential diagnoses are taken into account. Indeed the recorded prevalence of all non-specific pain and RRC-all (1,432/10,000) is substantially higher than community prevalence obtained from our meta-analysis (1,077/10,000). These comparisons are being made between five-year recorded prevalence versus annual or point community prevalence figures, which might account for the disparity observed. Further, our recorded five-year consultation prevalence figures represent patients' consulting practices and clinicians' diagnostic and coding behaviour. Community prevalence figures are based on strict ACR-90 CWP criteria that, we can argue, represent patients fitting an arbitrary definition with a diagnostic cut-off, which while useful for research, might be less useful clinically in a spectrum condition (Wolfe et al. 2010). So, while, the RRC definition may over-estimate CWP prevalence, suggesting that it is not specific to strict ACR-90 CWP, it does identify a group of patients who share features with CWP and who, through repeated consultations, are seeking help for their symptoms. The RRC definition is arguably therefore identifying a group of individuals who, while they may not meet established definitions of CWP, have a clinical need.

Unrecognised CWP patients (C. RRC-all not NS) had higher consultation rates, more somatic symptoms, and were more likely to be male than recognised CWP patients not fulfilling the RRC criteria (E. NS not RRC-all). The RRC-all definition identifies 33% (n=2,106) of recognised generalised pain consulters and these RRCs had higher consultation demands and were more

likely to be older and female than their unrecognised counterparts (C. RRC-all not NS). If we were interested in identifying all CWP consulters from their medical records then it would be important to consider including non-specific generalised pain consulters in the definition, however, the RRC criteria we are developing aim to identify a subgroup of CWP consulters who recurrently consult with regional pain and are unrecognised by their GPs as having a widespread pain condition.

The RRC phenotype appears to be a patient with a high consultation rate due to either poor health (increased need for consultation) or consultation behaviour (patient or clinician determined). The RRC definition identifies more patients than identified using solely non-specific generalised pain codes. The non-specific generalised pain consulters who are not identified by RRC criteria (E. NS not RRC-all) are patients with lower consultation rates, who are arguably less important to identify, (given that they have already been recognised as having a generalised pain condition and, therefore, their clinical need is likely to have been met), than those with the higher consultation demands whose clinical need may not have been met. We can conclude that consultation patterns, based on repeated consulting for regional musculoskeletal problems, are more important in identifying a group of musculoskeletal patients with high clinical need than specific morbidity codes for non-specifc generalised pain.

6.4.3 Strengths and limitations

a. Study population

The study population is the same as that used in Chapter Five, where we have already discussed the limitations of studying only those fully registered for a five year period. We have also discussed the geographical limitations of the CiPCA dataset and suggested that since community CWP prevalence has been shown to be consistent in Europe (Chapter Three) and the dataset has been demonstrated to give similar musculoskeletal consultation prevalence figures to a larger national database (Jordan et al. 2007), this may only have a small influence on generalisability.

b. Body regions

In this study we compared the number of recorded body regions consulted for and attempted to equate them to the ACR-90 CWP criteria. We argued that patients recorded as consulting for three body regions were more likely to fit self-reported CWP criteria. We must remember that coding will not present an accurate impression of the lived experience of chronic pain. The medical record captures coding practices and clinician and patient beliefs rather than the actuality of an individual's experience of pain. However, the number of recorded body regions present a measure of body pain distribution and therefore serves as a useful index of 'widespread-ness' and it is fair to say that those recorded with pain in at least three different body regions are more likely to have self-reported widespread pain. We will explore the association of RRC status with self-reported pain status in the next chapter.

c. Recognised and unrecognised CWP

We have used non-specific pain coding as a measure of recognised CWP. However, being recorded with one of the codes identified by our clinician advisory panel as likely to represent unexplained generalised musculoskeletal pain does not mean that a patient has CWP. Non-specific pain coding does, however, represent a patient for whom the clinician has recognised and recorded a generalised musculoskeletal pain condition not explained by inflammation, infection or injury and is therefore a useful proxy measure.

Those RRCs not coded with non-specific pain complaints, that we have termed unrecognised CWP, might have been recognised by their GPs has having generalised conditions but not recorded using one of the non-specific pain codes we have identified. However, we have

demonstrated differences (in age and gender distribution, somatic symptom count, frequent attender rate and consultation rate) between recognised and unrecognised RRCs.

d. Prevalence

We are attempting to compare RRC prevalence figures based on five years of consultation data with point prevalence estimates for CWP community prevalence. Research suggests that, for CWP patients who recover, there are an equal or higher number of incident cases (McBeth et al. 2001a, Papageorgiou et al. 2002). Since CWP prevalence remains consistent or increases over time (Croft et al. 1993, Hunt et al. 1999, McBeth et al. 2001a, Aggarwal et al. 2006) we might expect point prevalence estimates for CWP to be relatively similar to that based on five years of consultation data. However, care must be taken in making such comparisons, since not all patients included in five-year estimates will still self-report CWP at the end of the five-year period, five-year period prevalence is likely to over-estimate point prevalence.

The expected CWP consulting figure has been calculated by extrapolating from community prevalence figures using a consultation rate derived from one study that asked for self-reported recall of consultations (Macfarlane et al. 1999). Research has shown a disparity between self-reported consultation and medical records (Jordan et al. 2006) suggesting this estimate can only approximate recorded consultation prevalence.

6.5 Conclusions

The RRC-Rohrbeck group could be argued to perform slightly better by identifying a higher proportion of patients consulting for three body regions, as this is closer to the ACR-90 criteria for CWP. However RRC-all criteria also seem to reflect CWP characteristics. The distribution of body regions might serve as a useful starting point for the future development of a RRC severity scale.

RRC-all criteria identify a third of apparently recognised CWP in primary care. The remaining two-thirds of non-specific pain consulters have lower consultation rates and arguably, therefore, less clinical need. The RRC consultation pattern identifies a group of similar patients who are high users of primary care and findings from this chapter suggest that the RRC criteria are useful in identifying unrecognised CWP consulters with clinical need.

However, there continues to be a circular logic problem in developing the RRC definition since we define unrecognised CWP consulters based on consultation patterns requiring high consultation rates and then we test our definition using consultation metrics. In addition it appears the RRC definition identifies more patients than are likely to fit established CWP criteria. The next chapter therefore compares self-reported CWP status and general health with RRC status using a cohort of older adults with linked survey and medical record data.

Chapter 7
Association of recurrent regional consultation with self-reported pain status

7.1 Introduction

In the previous two chapters we have shown that recurrent regional consulters (RRCs) returned by three different lists of regional musculoskeletal Read codes (RRC-all: all regional codes; RRC-clinician: excluding from the list of all regional codes those felt by clinicians to be unlikely to represent CWP; RRC-Rohrbeck: original 2007 short codes list) have similar levels of recorded somatic symptoms, comorbidity, consultation rates and frequent attendance. The RRC-all definition identified over 60% more patients than the RRC-Rohrbeck definition but a higher percentage (55% of RRC-Rohrbeck, 46% of RRC-all) of patients identified using the RRC-Rohrbeck codes were recorded as consulting for all three body regions (axial, upper- and lower-limbs), and therefore possibly more likely to fit ACR-90 CWP criteria. The aim of this chapter was to investigate further how well the three RRC definitions may identify patients with CWP by assessing their association with self-reported CWP status. This was performed using health survey data with linked medical record data from a prospective three-year study of pain in the older population (Thomas et al. 2004b).

Since not all CWP patients will consult for their symptoms the RRC definition will not identify all self-reported CWP patients. Conversely, it is likely that the RRC consultation pattern will identify patients who do not satisfy the strict self-report ACR-90 CWP criteria. The hypothesis is therefore that there will be a substantial overlap between patients self-reporting CWP and RRCs, but that there will be some differences between the two patient groups, particularly in consultation profile (RRCs are more likely to consult frequently) and severity (due to the strictness of its criteria, ACR-90 CWP patients are more likely to have increased severity of symptoms).

7.2 Aims and objectives

The primary aim of this chapter was to test the association between fulfilling the RRC criteria and self-reported chronic widespread pain status.

Specifically:

1. To test the hypothesis that there is an association between having self-reported pain and being identified as a RRC by assessing the sensitivity, specificity, positive (PPV) and negative (NPV) predictive values of the RRC criteria in identifying self-reported widespread pain patients.

2. To test the hypothesis that RRCs who do not self-report CWP have a more similar profile to patients with self-reported widespread pain than patients consulting for single region pain (control group) do on age, gender, recorded somatic symptoms, consultation rate (musculoskeletal and non-musculoskeletal), frequent attendance, and self-reported general health, psychological dysfunction, and cognitive and sleep complaints.

3. To test the hypothesis that self-reported CWP patients who do not fulfil the RRC definition are less likely than RRCs to be frequent attenders (lower consultation rates and levels of frequent attendance) but more likely to have severe symptoms (worse self-reported mental and physical health, cognitive impairment, sleep complaints and psychological dysfunction).

7.3 Methods

This chapter compares self-reported chronic widespread pain status to RRC status. A comparison was made between RRCs and patients with self-reported widespread pain on age and gender, self-reported health status, consultation frequency, recorded number of somatic symptoms and frequent attendance.

7.3.1 Study population

The study population was drawn from the North Staffordshire Osteoarthritis Project (NorStOP), a prospective epidemiological study of pain and general health in community-dwelling adults aged 50 years and over (Thomas et a. 2004b). The study sample were those who had responded to both baseline and three-year postal health surveys from three identically recruited and measured cohorts (NorStOP 1: 2002, NorStOP 2: 2003, NorStOP 3: 2004, 2005), and who had consented to medical record review and had a minimum of five years of medical record data available. The cohorts were recruited through postal surveys of all patients aged 50 years and over registered with eight North Staffordshire general practices. In the United Kingdom it has been estimated that 98% of the population are registered with a GP (Bowling 1997); practice registers therefore provide a representative sample of local populations. Consenting responders were followed up at three years with a repeat postal health survey. Questionnaires were mailed with a letter from the GP practice, accompanied by a study information leaflet, and reminders were sent to non-responders after two and four weeks. Mailing lists were checked by GPs prior to mailing to exclude unsuitable patients (for example, patients with terminal illnesses or dementia). Full details of the study protocol and data collection have been published previously (Thomas et al. 2004b).

7.3.2 Self-reported pain status

Self-reported pain status was collected by postal questionnaire at baseline and three-year follow up. A self-completed body manikin was used to establish the location of body pain lasting for one day or longer in the past four weeks. Pain diagrams have been demonstrated to be a reliable means of classifying widespread pain based on existing criteria (Lacey et al. 2005).

ACR-90 widespread pain is defined as axial pain, pain in the left and right sides of the body, and pain above and below the waist (Wolfe et al. 1990). A more strict definition, proposed by Macfarlane et al. (1996a), has been termed the 'Manchester' definition. Like the ACR-90 criteria, pain must be present in at least two contralateral body quadrants, however, to reflect a more diffuse pattern of pain, for a body quadrant to be deemed positive, pain must be present in at least two regions of that quadrant (Hunt et al. 1999). Both definitions define chronicity as widespread pain of three months duration or longer. Due to the limitations of the self-reported data we have been unable to ascertain chronicity using this standard. Widespread pain at both baseline and three years has therefore been used here as a marker of 'persistent' widespread pain.

Self-reported widespread pain was classified into four non-mutually exclusive categories as:

1. ACR-90 widespread pain at baseline *or* three years.
2. ACR-90 widespread pain at baseline *and* three years (persistent widespread pain).
3. Manchester widespread pain at baseline *or* three years.
4. Manchester widespread pain at baseline *and* three years (persistent widespread pain).

Group two (ACR-90 widespread pain at baseline *and* three years) was a subgroup of group one (ACR-90 widespread pain at baseline *or* three years). Similarly, group four (Manchester widespread pain at baseline *and* three years) was a subgroup of group three (Manchester widespread pain at baseline *or* three years). Patients defined using the Manchester criteria (groups three and four) were subgroups of those defined using the ACR-90 criteria (groups one and two), reflecting the more stringent requirements of the Manchester definition.

7.3.3 Consultation-based pain status

Consultation-based pain status was established using linked medical record data for the five-year period starting two years prior to the baseline health questionnaire. Single-region controls and those fulfilling the RRC criteria were identified from data for the five-year study period. Consultation-based pain was classified into three non-mutually exclusive RRC categories and single-region controls:

1. Single-region controls recorded as consulting in just one of the three defined body regions (axial, upper limb or lower limb) during the five-year study period (see Chapter Five, section 5.3.1 for the Read codes used).
2. RRCs defined using the existing Rohrbeck-2007 regional musculoskeletal pain consultation criteria and the following three lists of regional musculoskeletal Read codes (see Chapter Five for further details):
    i. RRC-all: all regional musculoskeletal Read codes (documented in appendix A5.2).
    ii. RRC-clinician: excluding from the list of all regional musculoskeletal Read codes those felt by clinicians to be unlikely to be used for CWP patients (documented in appendix A5.2).
    iii. RRC-Rohrbeck: Rohrbeck's (2007) original short code list (documented in appendix A5.1).

7.3.4 Outcome measures

Self-reported and consultation-based widespread pain status were compared on self-reported health and consultation-based measures.

Self-reported health status was collected from baseline health questionnaire responses (see Table 7.1). General health was assessed using the SF-12 physical and mental health component summary scores (Ware et al. 1996) and the SF-36 physical function score (Ware et al. 1992). Psychological health was assessed using the Hospital Anxiety and Depression Scale (HADS Zigmond and Snaith 1983). Cognitive impairment was measured using the alertness subscale of the Sickness Impact Profile (SIP, Bergner et al. 1981). Sleep was assessed by four questions, in which respondents were asked if they had the following sleep problems on most nights: i) trouble falling asleep; ii) waking at night; iii) trouble staying asleep; and iv) waking up tired. A positive response to any of the four sleep questions was used to indicate a reported sleep problem.

Table 7.1 Measures of self-reported health at baseline.

Outcome measure		Score range	High score	Reference
SF-12	12 item short form health survey physical and mental component summary scores	General population mean score is 50 (SD 10). Scores higher than 50 are better than the general population.	Best health	Ware et al. 1996
SF-36	36 item short form health survey physical functioning subscale.	0–100	Best health	Ware et al. 1992
HADS	Hospital anxiety and depression scale.	0–21	Worst health	Zigmond and Snaith 1983
SIP	Sickness impact profile alertness subscale.	0–100	Worst health	Bergner et al. 1981

Consultation-based measures comprised somatic symptom count, frequent attendance, and musculoskeletal and non-musculoskeletal consultation counts in the same five-year period as used to define RRCs. These have been defined previously (see Chapter Five, section 5.3). Somatic symptoms were calculated using 340 Read codes (presented in Chapter Five, section 5.3.4) corresponding to 40 physical symptoms documented in the ACR-2010 fibromyalgia criteria (Wolfe et al. 2010). For each patient the number of somatic symptoms consulted for in the five years was calculated.

Non-musculoskeletal frequent attenders were defined as the top 10% of attenders for non-musculoskeletal problems (as in Chapter Five, section 5.3.5). Non-musculoskeletal problems were defined as consultations coded with any Read code (including administrative or process of care

Read codes from numerical Read code chapters) except those identified by Jordan et al. (2010) as being musculoskeletal in nature. The percentage who were non-musculoskeletal frequent attenders and the mean number of musculoskeletal and non-musculoskeletal consultations for the five years was calculated.

7.3.5 Analysis

a. Participation bias

Potential participation bias was examined by comparing three groups: i) non-responders at baseline; ii) incomplete responders who either responded to baseline only, or responded at baseline and three-years but did not consent to medical record review or had less than five years of medical record data; and iii) those included in this analysis (the 'study population'). Differences observed between the study population and non-responders or incomplete responders would suggest participation bias. Non-responders (group i) and those included in this analysis (group iii) were compared descriptively on gender distribution and on mean age.

Those included in this analysis (group iii) and incomplete responders (group ii) were compared on baseline deprivation score (measured using ranked Index of Multiple Deprivation 2004, Payne and Abel 2012), marital status, current employment status, social class (Office for National Statistics, 2005), SF-12 mental and physical health component scores, SF-36 physical function score, HADs anxiety and depression scores, cognitive impairment (SIP alertness sub-scale), percentage of patients with any self-reported pain at baseline, and ACR-90 or Manchester widespread pain at baseline.

b. Association of consultation-based pain status with self-reported pain status

The association of consultation-based pain status with self-reported pain status was assessed. We first calculated the percentage of individuals with at least one recorded musculoskeletal consultation in primary care during the five-year period who also self-reported pain on the body manikin. The three RRC definitions (RRC-all, RRC-clinician and RRC-Rohrbeck) were then evaluated against the self-reported pain definitions (any pain, and the four ACR-90 and Manchester widespread pain definitions given in section 7.3.2) by calculating sensitivity, specificity, positive (PPV) and negative (NPV) predictive values of the RRC definitions for each of these self-reported pain definitions. Sensitivity measures the proportion of actual positives that are

correctly identified by a test. So, using the ACR-90 CWP criteria as the example, here it is the percentage of respondents fulfilling the ACR-90 criteria who were identified using the RRC definition. Specificity measures the proportion of true negatives who are correctly identified by a test (the percentage of respondents not fulfilling the ACR-90 criteria who were not identified as RRCs). PPV is the proportion of those with positive test results who have the condition (the percentage of RRCs who fulfilled the ACR-90 criteria). Conversely, NPV is the proportion of patients with a negative test result who do not have the condition (the percentage of non-RRCs who did not fulfill the ACR-90 criteria).

Confidence intervals for sensitivity, specificity, PPV and NPV were calculated using Wilson's method (Newcombe 1998). A spreadsheet was developed incorporating formulae for calculating the 95% confidence interval for a proportion.

c. Comparison of consultation-based pain and self-reported pain patients

Mean age, percentage who were women, mean five-year somatic symptom count, musculoskeletal and non-musculoskeletal consultation counts, and percentage who were non-musculoskeletal frequent attenders were determined for each RRC and control group, and for respondents fulfilling the self-reported pain definitions.

Measures of self-reported general health status at baseline were also determined for each RRC and control group, and for responders fulfilling the self-reported pain definitions. These were the mean SF-12 mental and physical health components, SF-36 physical function, psychological dysfunction (measured using HADS anxiety and depression measure), and cognitive complaints (measured using Sickness Impact Profile alertness behaviour scale) scores. We also determined the percentage reporting any sleep problem.

For the main analysis, we used the RRC-all definition only to compare RRC status with self-reported CWP status defined as having ACR-90 widespread pain at both baseline and three years. Specifically we compared the following four mutually exclusive groups of patients:

A. RRC and CWP: RRC-all patients who also fulfilled the self-reported ACR-90 widespread pain criteria at both baseline and three years.
B. RRC not CWP: RRC-all patients who did not fulfill the ACR-90 widespread pain criteria at both baseline and three years.
C. CWP not RRC: Respondents who fulfilled the ACR-90 widespread pain criteria at both baseline and three years but who did not meet the RRC-all criteria.
D. Controls not CWP: Controls recorded as consulting for a musculoskeletal problem in a single region only (axial or upper-limb or lower-limb) for the five-year period from two years prior to baseline to three years after baseline, and who did not fulfill the ACR-90 criteria at baseline and three years.

These four groups (A to D) were first compared descriptively on age, gender, somatic symptoms, musculoskeletal and non-musculoskeletal consultation count, percentage who were frequent attenders and self-reported mental and physical health status (measured using SF-12 mental and physical health component summary scores, SF-36 physical function score, HADS anxiety and depression scores, SIP cognitive impairment score and one or more sleep problems reported on most nights).

The four groups were compared to test the hypotheses that: i) RRCs not self-reporting CWP (Group B) were more similar to CWP patients who were not identified as RRCs (Group C) than to controls who did not self-report CWP (Group D) (objective 2); and ii) self-reported CWP patients who were not RRCs (Group C) have better consultation-based health (lower consultation rates and levels of frequent attendance), but worse self-reported health (worse self-reported mental and physical health, cognitive impairment, sleep complaints and psychological dysfunction) than self-reported CWP patients who are RRCs (Group A) (objective 3). Differences between the groups were tested by fitting nine separate regression models to the data. Logistic regression, controlling for age and gender, was used to assess association of group membership with the dichotomous outcome variables of frequent attendance, recording of one or more somatic symptoms and

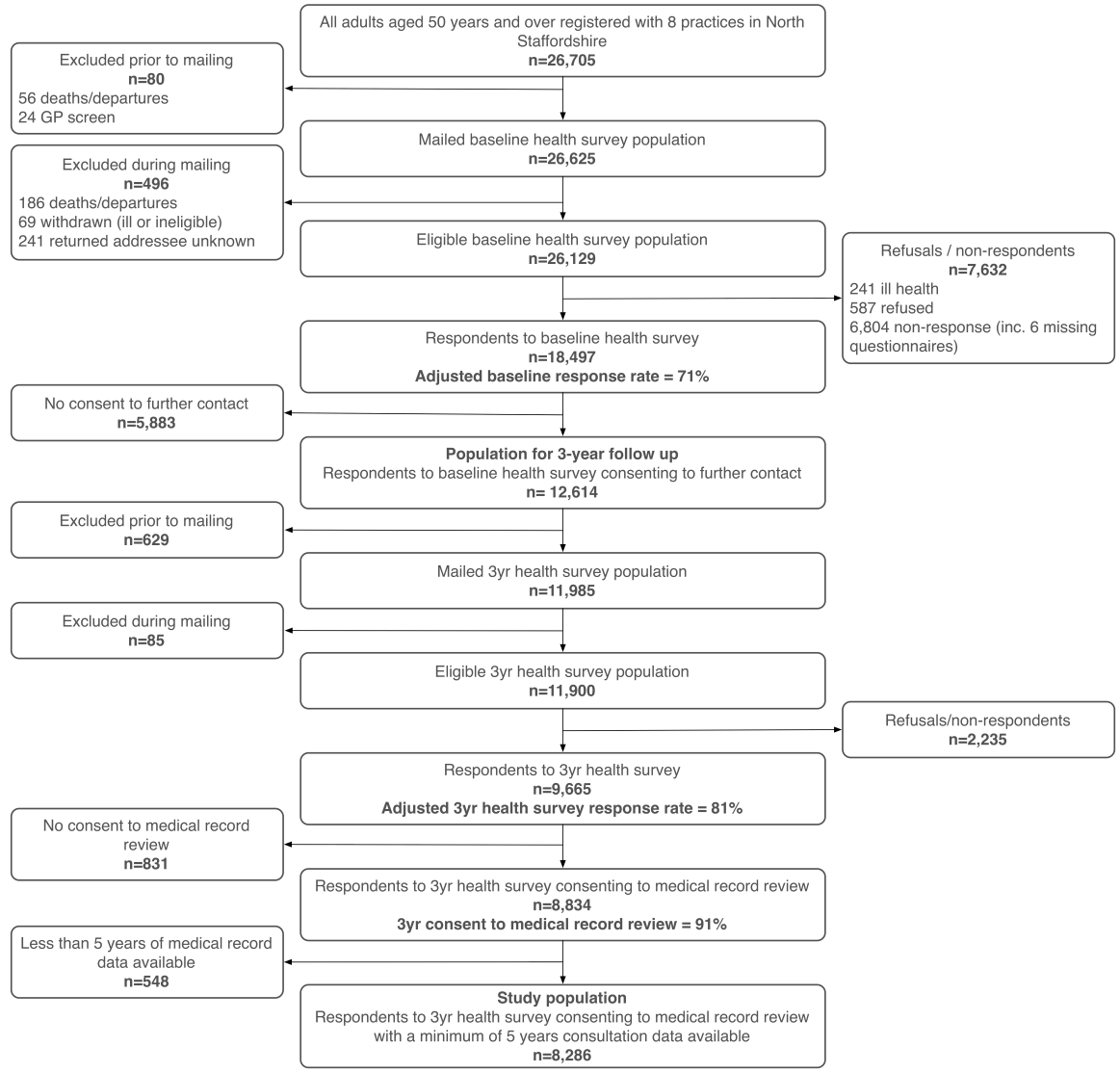
reporting of one or more sleep problems on most nights (with group D: controls not reporting CWP as the reference category). Linear regression was used to assess the association of group membership with the continuous outcome variables of SF-12 mental and physical component scores, SF-36 physical function, SIP cognitive impairment score, and HADs anxiety and depression scores again controlling for age and gender.

7.4 Results

7.4.1 Study population

Of 26,129 eligible participants (adults aged 50 or over and registered with one of the eight practices in the NorStOP study) at baseline, 71% (n=18,497) responded to the baseline health survey questionnaire. Of those consenting to follow-up and still registered with the GP (n=11,900), 81% (n=9,665) responded to the three-year follow up questionnaire. Of the 9,665 people responding to both baseline and three-year questionnaires, 9% (n=831) did not consent to medical record review and 6% (n=548) had access to less than five years of medical record data, leaving 8,286 participants who returned both baseline and 3-year questionnaires and had access to a minimum of five years of medical record data and hence were eligible for inclusion in this analysis (see Figure 7.1).

Figure 7.1. Participation flowchart.



a. Participation bias

Table 7.2 presents a baseline comparison of non-responders, incomplete responders (either baseline only responders or baseline and three-year responders without access to five years of medical record data), and the study population (those eligible for the study analysis).

Non-responders at baseline were older, although mean difference was less than one year (mean difference = 0.86 years, 95% CI: 0.53, 1.18), and more likely to be male (non-responders: 49% male; study population: 46% male, percentage difference: 3%) than the study population.

Incomplete responders (either baseline only responders, or baseline and three-year responders without access to five years of medical record data) showed generally small differences from the study population on all baseline variables assessed (see Tables 7.2 and 7.3). Complete responders (the study population) were younger (mean difference = 3.13 years, 95% CI 2.84, 3.43), less likely to be female (OR 0.88, 95% CI 0.83, 0.93), were less deprived (deprivation score mean difference = 1,118, 95% CI: 900, 1,335), and more likely to be married or cohabiting (OR 1.49, 95% CI 1.40, 1.58), to self-report pain (any self-reported pain: OR 1.34, 95% CI 1.26, 1.42; ACR-90 widespread pain: OR 1.26, 95% CI 1.18, 1.36; Manchester widespread pain: OR 1.34, 95% CI 1.14, 1.36), be in paid employment (OR: 1.44, 95% CI 1.35, 1.54), and of a high social class (OR 1.70, 95% CI 1.57, 1.85) than incomplete responders. When compared to incomplete responders, the study population (complete responders), had better baseline self-reported mental (SF-12 mental component score mean difference = 1.69, 95% CI 1.34, 2.03; HADS anxiety mean difference = -0.33, 95 % CI -0.46, -0.21; HADS depression mean difference = -0.81, 95% CI -0.92, -0.70) and physical health (SF-12 physical component score mean difference = 1.91, 95% CI 1.53, 2.31; SF-36 physical function score mean difference = 6.82, 95% CI 5.87, 7.76) and less cognitive impairment (SIPS mean difference = -3.95, 95% CI -4.65, -3.25).

Table 7.2 Comparison of responders and non-responders

	Non-responders	Incomplete responders**	Study population
	(n = 7,632)	(n =10,211)	(n = 8,286)
Gender			
Female	3,883 (51%)	5,834 (57%)	4,477 (54%)
Male	3,7469 (49%)	4,377 (43%)	3,809 (46%)
Age, mean (sd)	65.3 (11.7)	67.6 (10.8)	64.5 (9.1)
Marital status*			
Married or cohabiting	-	6,493 (65%)	6,007 (72%)
Not married or cohabiting	-	3,540 (35%)	2,203 (27%)
Current employment status*			
Paid employment		2,348 (24%)	2,513 (30%)
Not in paid employment (unemployed, retired, ill health, housewife, other)		7,434 (73%)	5,522 (67%)
Social class[a] *			
High	-	1,357 (13%)	1,701 (21%)
Middle	-	1,471 (14%)	1,546 (19%)
Low	-	6,181 (61%)	4,546 (55%)
Deprivation score [b], mean (sd)*	-	12,836 (7,574)	13,953 (7,451)
Self-reported health at baseline			
SF-12 physical component score (0-100)[c], mean (sd)*	-	40.5 (12.6)	42.4 (12.2)
SF-12 mental component score (0-100)[c], mean (sd)*	-	48.5 (11.2)	50.2 (10.8)
SF-36 physical function score (0-100)[d], mean (sd)*	-	59.2 (33.1)	66.0 (29.9)
Anxiety (0-21)[e], mean (sd)*	-	6.8 (4.2)	6.5 (4.1)
Depression (0-21)[e], mean (sd)*	-	5.1 (3.8)	4.3 (3.5)
Cognitive impairment (0-100)[f], mean (sd)*	-	16.3 (25.2)	12.4 (20.9)
Baseline self-reported pain (%)*	-	6,750 (66%)	5,989 (72%)
Baseline ACR-90 widespread pain (%)*	-	1,892 (19%)	1,850 (22%)
Baseline Manchester widespread pain (%)*	-	1,145 (11%)	1,125 (14%)

a. Higher = higher managerial, higher professional or lower managerial/professional. Middle = intermediate occupations or self-employed. Lower = lower supervisory/technical, semi-routine or routine occupations (Office for National Statistics 2005).
b. Rank index of multiple deprivation (Payne and Abel 2012) (low score = high deprivation)
c. 12 item short form health survey – physical and mental component summary scores (Ware et al. 1996) (100 best health)
d. 36 item short form health survey – physical functioning subscale (Ware et al. 1992) (100 best health)
e. Hospital Anxiety and Depression Scale (Zigmond and Snaith 1983) (21 worst health)
f. Sickness Impact Profile – alertness subscale (Bergner et al. 1981) (100 worst health)
sd. standard deviation
*Data on these variables were incomplete with n ranging from 8,456 to 10,210 for incomplete responders and 7,444 to 8,283 for the study population.
** Baseline only responders or responders to baseline and 3 years with either no consent to medical record review or access to less than 5 years of medical record data.

Table 7.3 Comparison of incomplete responders (reference group) to the study population.

		OR (95% CI)
Female		0.88 (0.83, 0.93)
Married or cohabiting		1.49 (1.40, 1.58)
Any self-reported pain		1.34 (1.26, 1.42)
ACR-90 widespread pain		1.26 (1.18, 1.36)
Manchester widespread pain		1.24 (1.14, 1.36)
Paid employment		1.44 (1.35, 1.54)
Social class*	Low	1
	Middle	1.43 (1.32, 1.55)
	High	1.70 (1.57, 1.85)
		Mean difference (95% CI)
Age		-3.13 (-3.43, -2.84)
Deprivation score		1,118 (900, 1,335)
SF-12 physical component score		1.91 (1.53, 2.31)
SF-12 mental component score		1.69 (1.34, 2.03)
SF-36 physical function score		6.82 (5.87, 7.76)
HADS anxiety		-0.33 (-0.46, -0.21)
HADS depression		-0.81 (-0.92, -0.70)
SIP cognitive impairment		-3.95 (-4.65, -3.25)

*Odds ratios from logistic regression with low social class as the reference category.
All self-reported health and pain measures from baseline health survey responses.

b. Study population

Of the 8,286 individuals included in the study population, 54% were female, the majority (70%, n=5,811) were between 50 and 69 years of age, 72% (n=5,848) were married, 30% (n=2,513) were employed, and 51% (n=4,220) were retired.

c. Prevalence of pain

Seventy-two percent of the study population self-reported musculoskeletal pain at baseline. Eighty-five percent (n=7,076) reported pain at either baseline or three years. Fifty-seven percent (n=4,740) reported two-region pain (axial pain at baseline and/or three years and pain in either upper- or lower-limb at baseline and/or three years). Forty-one percent (n=3,437) reported three-region pain (axial pain at baseline and/or three years and pain in both upper- and lower-limbs at baseline and/or three years). Two thousand, eight hundred and seventy-three people (37%) reported ACR-90 widespread pain at baseline *or* three years – of which 1,190 (14% of all the study population) reported ACR-90 widespread pain at baseline *and* three years. One thousand, eight hundred and sixty-two people (22%) reported Manchester widespread pain at baseline *or* three years – of which 658 (8% of all the study population) reported Manchester widespread pain at baseline *and* three years.

Eighty percent (n=6,611) of the study population had a recorded musculoskeletal consultation in the five-year period starting two years before the baseline health survey. RRC prevalence ranged from 905 per 10,000 population for RRC-Rohrbeck, to 1,737 for RRC-clinician, and 2,155 for RRC-all. Control prevalence was 2,388 per 10,000 population.

7.4.2 Association of consultation-based pain status with self-reported pain status

Ninety percent of patients with a recorded musculoskeletal consultation also self-reported pain at baseline or three years (see Table 7.4). Virtually all RRCs (97% to 99% by definition used) had self-reported pain. Between 53% and 57% of RRCs, depending on RRC definition, reported ACR-90 widespread pain at either baseline or three years, while 37% to 41% reported Manchester definition widespread pain at either baseline or three years. For reporting widespread pain at both baseline and three years, figures ranged by RRC definition from 25% to 29% for ACR-90 widespread pain, and 14% to 16% for Manchester definition widespread pain. Controls recorded with single-region (axial, upper or lower limb) pain reported less widespread pain than RRCs – with between 16% (Manchester) and 27% (ACR-90) reporting widespread pain at baseline or three years, and 5% (Manchester) and 10% (ACR-90) reporting widespread pain at both baseline and three years.

Table 7.4 Primary care musculoskeletal consultation by self-reported pain (n, column %'s).

	Primary care recorded pain					
Self reported pain	Any recorded MS consultation	Control	RRC-all	RRC-clinician	RRC-Rohrbeck	**Total**
Any musculoskeletal pain	5,933 (90)	1,648 (83)	1,727 (97)	1,399 (97)	741 (99)	**7,076**
ACR-90 widespread pain (baseline *or* 3 years)	2,603 (39)	532 (27)	942 (53)	782 (54)	424 (57)	**2,873**
ACR-90 widespread pain (baseline *and* 3 years)	1,112 (17)	194 (10)	445 (25)	384 (27)	214 (29)	**1,190**
Manchester widespread pain (baseline or 3 years)	1,705 (26)	314 (16)	652 (37)	553 (38)	304 (41)	**1,862**
Manchester widespread pain (baseline *and* 3 years)	625 (9)	98 (5)	249 (14)	249 (14)	121 (16)	**658**
Total	**6,611**	**1,979**	**1,786**	**1,439**	**750**	

NB: Column %'s represent positive predictive values.

Sensitivity, specificity, positive and negative predictive values of RRC definitions for the measures of self-reported pain (from any self-reported pain to the most severe widespread pain definition – Manchester widespread pain at baseline and three years) are presented in Table 7.5. Sensitivity and NPV were highest for the RRC-all definition (for example, sensitivity: 37% and NPV: 89% for ACR-90 widespread pain at baseline and three years) and lowest for the RRC-Rohrbeck definition (sensitivity: 18% and NPV: 87% for ACR-90 widespread pain at baseline and three years). Specificity and PPV demonstrated the opposite trend, with the highest figures observed in the RRC-Rohrbeck definition (specificity: 92% and PPV: 29% for ACR-90 widespread pain at baseline

and three years) and the lowest in the RRC-all group (specificity: 81% and PPV: 25% for ACR-90 widespread pain at baseline and three years).

Sensitivity and NPV were higher for the more stringent self-reported pain definitions; with sensitivity for RRC-all ranging from 24% for any self-reported pain to 38% for Manchester widespread pain at baseline and three years. Specificity and PPV demonstrated the reverse relationship with higher figures seen in the broader self-reported pain definitions; with specificity ranging from 80% for Manchester definition widespread pain at baseline and three years to 95% for any self-reported pain.

Table 7.5 Sensitivity, specificity, positive predictive value and negative predictive value for RRC status as a means of identifying self-reported pain.

Consultation-based pain	Self-reported pain	Sensitivity (95% CI)	Specificity (95% CI)	PPV (95% CI)	NPV (95% CI)
RRC-all	Any (baseline *or* 3 years)	24 (23, 25)	95 (94, 96)	97 (96, 97)	18 (17, 19)
	ACR-90 widespread pain (baseline *or* 3 years)	33 (31, 35)	84 (83, 85)	53 (50, 55)	70 (69, 71)
	ACR-90 widespread pain (baseline *and* 3 years)	37 (35, 40)	81 (80, 82)	25 (23, 27)	89 (88, 89)
	Manchester widespread pain (baseline *or* 3 years)	35 (33, 37)	82 (81. 83)	37 (34, 39)	81 (80, 82)
	Manchester widespread pain (baseline *and* 3 years)	38 (34, 42)	80 (79, 81)	14 (12, 16)	94 (93, 94)
RRC-clinician	Any (baseline *or* 3 years)	20 (19, 21)	97 (96, 98)	97 (96, 98)	17 (16, 18)
	ACR-90 widespread pain (baseline *or* 3 years)	27 (26, 29)	88 (87, 89)	54 (52, 57)	69 (68, 71)
	ACR-90 widespread pain (baseline *and* 3 years)	32 (30, 35)	85 (84, 86)	27 (24, 29)	88 (87, 89)
	Manchester widespread pain (baseline *or* 3 years)	30 (28, 32)	86 (85, 87)	38 (36, 41)	81 (80, 82)
	Manchester widespread pain (baseline *and* 3 years)	32 (29, 36)	84 (83, 85)	15 (13, 17)	93 (93, 94)
RRC-Rohrbeck	Any (baseline *or* 3 years)	10 (10, 11)	99 (99, 100)	99 (98, 99)	16 (15, 17)
	ACR-90 widespread pain (baseline *or* 3 years)	15 (14, 16)	94 (93, 95)	57 (53, 60)	68 (66, 69)
	ACR-90 widespread pain (baseline *and* 3 years)	18 (16, 20)	92 (92, 93)	29 (16, 20)	87 (86, 88)
	Manchester widespread pain (baseline *or* 3 years)	16 (15, 18)	93 (92, 94)	41 (37, 44)	79 (78, 80)
	Manchester widespread pain (baseline *and* 3 years)	18 (16, 22)	92 (91, 92)	16 (14, 19)	93 (92, 93)

PPV: Positive predictive value
NPV: Negative predictive value

7.4.3 Comparison of consultation-based and self-reported pain status

a. Descriptive comparison of patients with consultation-based and self-reported pain

Age, gender and consultation-based measures of health in RRCs, controls and participants with any self-reported pain or widespread pain are presented in Table 7.6 (note that RRC and self-reported widespread pain groups are not mutually exclusive in this analysis). Mean age was similar in all groups. The percentage of women was lowest in the consultation-based control group (49%) and ranged from 60% to 66% for patients with self-reported widespread pain, which was similar to the figure of 61% observed in RRCs. Recorded number of somatic symptoms was higher in RRCs (mean 2.66) than in controls (mean 1.24). Mean somatic symptom count in patients self-reporting widespread pain (ranging from 2.01 for ACR-90 widespread pain at baseline or three years to 2.36 for Manchester widespread pain at baseline and three years) approached, but was not as high as, that in RRCs (2.66). Similarly, the percentage who were frequent attenders, and the mean musculoskeletal and non-musculoskeletal consultation counts were higher for those defined as RRCs than for both controls and for respondents with self-reported widespread pain however, figures for those self-reporting widespread pain were closer to RRCs than to controls.

Table 7.6 Age, gender, mean number of somatic symptoms, musculoskeletal and non-musculoskeletal consultations and percentage who were frequent attenders for cases/controls and self-reported pain.

		n	Mean age (sd)	Female (%)	Mean somatic symptom count (sd)	Mean non-MS consultation count (sd)	Mean MS consultation count (sd)	FAs (%)
Consultation based pain	RRC-all	**1,786**	65 (9)	61	2.66 (2.10)	44 (27)	12 (8)	23
	Control	**1,979**	64 (9)	49	1.24 (1.41)	26 (20)	2 (2)	5
Self-reported pain	Any self-reported MS pain (baseline or 3 years)	**7,076**	64 (9)	55	1.71 (1.79)	33 (25)	6 (7)	12
	ACR-90 widespread pain (baseline *or* 3 years)	**2,873**	64 (8)	60	2.01 (1.95)	37 (26)	7 (8)	15
	ACR-90 widespread pain (baseline *and* 3 years)	**1,190**	64 (9)	64	2.21 (1.99)	39 (25)	8 (9)	18
	Manchester widespread pain (baseline *or* 3 years)	**1,862**	64 (9)	62	2.08 (1.95)	38 (26)	8 (9)	17
	Manchester widespread pain (baseline *and* 3 years)	**658**	64 (9)	66	2.36 (2.06)	41 (25)	9 (8)	20

FA: Top 10% of non-musculoskeletal attenders.
MS: Musculoskeletal

Measures of self-reported mental and physical health and sleep problems for RRCs, controls and patients with self-reported pain are presented in Table 7.7. In patients self-reporting widespread pain all measures were worse for the subgroup with widespread pain at both baseline *and* three years than for the total group who reported pain at either baseline *or* three years, and all measures were worse for those fulfilling Manchester criteria than for those fulfilling ACR-90 criteria at corresponding time points (baseline *or* three years versus baseline *and* three years). All measures were worse for widespread pain patients than for those with any self-reported pain.

The three groups of RRCs were similar to one another on baseline self-reported health measures. However, although the differences between RRC groups are small, the RRC-Rohrbeck subgroup reported slightly lower standards of health on all measures, except cognitive impairment.

Respondents with self-reported widespread pain had worse self-reported health than those defined as RRCs on all measures.

Table 7.7 Self-reported mental and physical health* in consultation-defined cases/controls and respondents with self-reported pain.

	Recorded pain				Self reported pain				
Outcome measure mean (sd)*	Control	RRC-all	RRC-clinician	RRC-Rohrbeck	Any self-reported pain (baseline or 3 years)	ACR-90 widespread pain (baseline *or* 3 years)	ACR-90 widespread pain (baseline *and* 3 years)	Manchester widespread pain (baseline *or* three years)	Manchester widespread pain (baseline *and* three years)
SF-12 physical health component score (0–100) [a]	44.5 (11.7)	36.8 (11.8)	36.0 (11.6)	35.0 (11.3)	40.3 (12.3)	35.9 (11.7)	31.7 (10.6)	33.6 (11.2)	28.9 (9.5)
SF-12 mental health component score (0–100)[a]	51.1 (10.4)	47.6 (11.7)	47.6 (11.8)	47.4 (11.6)	49.3 (11.2)	47.1 (12.0)	45.8 (12.3)	46.4 (12.4)	45.0 (12.5)
SF-36 physical function score (0–100) [b]	71.8 (27.2)	53.6 (30.4)	52.0 (30.2)	49.2 (29.8)	62.7 (30.2)	49.8 (30.1)	39.7 (28.4)	43.9 (12.4)	32.4 (26.4)
Anxiety (0–21) [c]	6.1 (4.0)	7.5 (4.1)	7.5 (4.2)	7.8 (4.1)	6.8 (4.1)	7.9 (4.3)	8.5 (4.4)	8.2 (4.3)	9.0 (4.4)
Depression (0–21) [c]	3.9 (3.3)	5.2 (3.5)	5.2 (3.5)	5.4 (3.5)	4.6 (3.5)	5.6 (3.8)	6.4 (3.8)	6.1 (3.8)	7.0 (4.0)
Cognitive impairment (0–100) [d]	10.9 (19.9)	16.1 (22.8)	16.6 (23.2)	16.3 (23.0)	13.2 (21.7)	18.5 (24.5)	21.7 (25.8)	20.6 (25.8)	24.9 (28.1)
*Number (%) reporting sleep problems on most nights***									
Trouble falling asleep	209 (11%)	325 (19%)	270 (19%)	145 (20%)	968 (14%)	579 (21%)	302 (26%)	440 (24%)	205 (32%)
Waking at night	553 (29%)	671 (38%)	561 (40%)	298 (41%)	2,264 (33%)	1,192 (42%)	593 (51%)	845 (46%)	359 (56%)
Trouble staying asleep	367 (19%)	454 (27%)	377 (27%)	207 (29%)	1,467 (22%)	833 (30%)	412 (36%)	600 (32%)	263 (42%)
Waking tired	254 (13%)	404 (23%)	347 (25%)	190 (26%)	1,218 (18%)	763 (27%)	406 (35%)	574 (31%)	266 (41%)
Any of the sleep problems above	683 (35%)	818 (46%)	686 (48%)	362 (48%)	2,768 (39%)	1,447 (50%)	710 (60%)	1,020 (55%)	426 (65%)
	1,979	**1,786**	**1,439**	**750**	**7,076**	**2,873**	**1,190**	**1,862**	**658**

a. 12 item short form health survey – physical and mental component summary scores (Ware et al. 1996)
b. 36 item short form health survey – physical functioning subscale (Ware et al. 1992)
c. Hospital Anxiety and Depression Scale (Zigmond and Snaith 1983)
d. Sickness Impact Profile – Alertness subscale (Bergner et al. 1981)
*Data on these variables were incomplete with n ranging from: 1,550 to 1,741 for RRC-all; 1,239 to 1,399 for RRC-clinician; 652 to 734 for RRC-Rohrbeck; 1,811 to 1,945 for controls; 5,521 to 6,938 for any self-reported pain; 2,543 to 2,829 for ACR-90 widespread pain at baseline *or* three years; 1,056 to 1,178 for ACR-90 widespread pain at baseline *and* three years; 1,636 to 1,838 for Manchester widespread pain at baseline or three years; and 577 to 650 for Manchester widespread pain at baseline and three years.
**Percentages calculated using n equal to participants providing valid responses only.

b. Consultation-based health of RRCs and CWP patients

Twenty-five percent (n=445) of RRC-all patients self-reported CWP (defined here as ACR-90 widespread pain at both baseline and three years), while RRCs represented 37% of CWP patients. Table 7.8 presents age, gender, and consultation-based measures for the following four mutually exclusive groups:

A. RRC-all and self-reported CWP

B. RRC-all and not self-reported CWP

C. Self-reported CWP and not RRC

D. Controls and not self-reported CWP

Table 7.8 Age, gender and consultation-based measures by RRC and self-reported CWP status (ACR-90 at baseline and three years).

	Mean age (sd)	Female (%)	Mean somatic symptom count (sd)	Mean non-MS consultation count (sd)	Mean MS consultation count (sd)	FAs (%)	n
A. RRC and CWP	64 (9)	67	2.90 (2.16)	47 (26)	13 (8)	27	**445**
B. RRC not CWP	65 (9)	59	2.58 (2.07)	44 (28)	11 (8)	21	**1,341**
C. CWP not RRC	64 (9)	62	1.80 (1.75)	34 (23)	6 (9)	12	**745**
D. Controls not CWP	64 (9)	48	1.21 (1.39)	26 (20)	2 (2)	5	**1,785**

The results of two binary logistic regression analyses assessing the association of group membership with: i) frequent attendance; and ii) recording of one or more somatic symptoms, adjusted for age and gender are shown in Table 7.9. The two groups of RRCs (A. RRC and CWP; B. RRC not CWP) had the highest odds of frequent attendance (A. RRC and CWP, OR 7.07, 95% CI 5.21, 9.58; B. RRC not CWP, OR 4.99, 95% CI 3.87, 6.43) compared to the control group, and being recorded with one or more somatic symptoms (A. RRC and CWP, OR 4.73, 95% CI 3.45, 6.47; B. RRC not CWP, OR 4.03, 95% CI 3.34, 4.86).

The group of patients self-reporting CWP who were not identified as RRCs (Group C) had over twice the odds (OR 2.55, 95% CI 1.86, 3,48) of the control group (D. Control not CWP) of being frequent attenders, and nearly twice (OR 1.89, 95% CI 1.55, 2.30) the odds of having at least one recorded somatic symptom.

Table 7.9 Results of two logistic regression analyses to assess the association of: i) frequent attendance; and ii) recording of one or more somatic symptoms, with group membership (with group D as the reference category), controlling for age and gender.

	Number (%)	p-value	OR (95% CI)
Frequent attendance[a]			
Group A. RRC and CWP	121 (27%)	**<0.001**	7.07 (5.21, 9.58)
Group B. RRC not CWP	284 (21%)	**<0.001**	4.99 (3.87, 6.43)
Group C. CWP not RRC	88 (12%)	**<0.001**	2.55 (1.86, 3.48)
Group D. Controls not CWP (reference)	87 (5%)		1
One or more somatic symptoms[b]			
Group A. RRC and CWP	396 (89%)	**<0.001**	4.73 (3.45, 6.47)
Group B. RRC not CWP	1,171 (87%)	**<0.001**	4.03 (3.34, 4.86)
Group C. CWP not RRC	567 (76%)	**<0.001**	1.89 (1.55, 2.30)
Group D. Controls not CWP (reference)	1,111 (62%)		1

a. Frequent attendance model χ^2 (5) = 334.96, p<0.001

b. One or more somatic symptoms model χ^2 (5) = 373.65, p<0.001

OR: odds ratio

p-values in bold are less than or equal to 0.05.

c. Self-reported health of RRCs and CWP patients

Table 7.10 presents self-reported health measures for the same four mutually exclusive patient groups analysed in the previous section: A) RRC and CWP; B) RRC not CWP; C) CWP not RRC; and D) Controls not CWP. The two groups of patients self-reporting CWP (A. RRC and CWP; C. CWP not RRC) had the most severe self-reported health on all measures. The controls (Group D. Controls not CWP) had the best self-reported health and RRCs not self-reporting CWP had more severe self-reported health than the control group, but were not as severely affected as the two groups self-reporting CWP (A. RRC and CWP; C. CWP not RRC).

Table 7.10 Mean (sd) of baseline self-reported health measures* by RRC and CWP status.

	SF-12 mcs[a]	SF-12 pcs[a]	SF-36 pfs[b]	Anxiety[c]	Depression[c]	Cognitive impairment[d]	Sleep problems on most nights (%)	n
A. RRC and CWP	45.1 (12.5)	30.3 (9.5)	37.0 (26.7)	8.8 (4.3)	6.6 (3.6)	22.6 (26.1)	60	**445**
B. RRC not CWP	48.4 (11.3)	39.0 (11.7)	59.2 (29.5)	7.0 (4.0)	4.7 (3.3)	13.9 (21.2)	41	**1,341**
C. CWP not RRC	46.2 (12.2)	32.6 (11.1)	41.3 (29.3)	8.4 (4.4)	6.3 (4.0)	21.2 (25.6)	59	**745**
D. Controls not CWP	51.6 (10.1)	45.7 (11.1)	74.7 (25.9)	5.9 (3.9)	3.7 (3.1)	9.9 (19.0)	32	**1,785**

a. 12 item short form health survey – physical and mental component summary scores (Ware et al. 1996)
b. 36 item short form health survey – physical functioning subscale (Ware et al. 1992)
c. Hospital Anxiety and Depression Scale (Zigmond and Snaith 1983)
d. Sickness Impact Profile – Alertness subscale (Bergner et al. 1981)
sd. Standard deviation
* Data on these variables were incomplete with n ranging from: 391 to 439 for group A; 1,159 to 1,302 for group B; 665 to 739 for group C; and 1,633 to 1,753 for group D.

The data were analysed with: 1) logistic regression to assess the association of group membership with reporting sleep problems on most nights, adjusted for age and gender (Table 7.11); and 2) six separate multiple linear regression analyses to assess the association (adjusted for age and gender) of group membership with: i) SF-12 mental component score; ii) SF-12 physical health component score; iii) SF-36 physical function score; iv) cognitive impairment (SIPS alertness subscale); v) HADS anxiety score; and vi) HADS depression score (Table 7.12). Group membership was shown to be significantly associated with all seven baseline self-reported health measures.

The two groups self-reporting CWP (A. RRC and CWP; C. CWP not RRC) had the highest odds of reporting a sleep problem on most nights, with odds three times (A. RRC and CWP, OR 3.07, 95% CI 2.47, 3.81; C. CWP not RRC, OR 2.97, 95% CI 2.48, 3.54) that of the control group (D. Controls not CWP), while RRCs not self-reporting CWP (B. RRC not CWP) had 1.4 times the odds of the control group to report sleep problems (OR 1.42, 95% CI 1.22, 1.64).

Table 7.11 Results of logistic regression analyses to assess the association of reporting of sleep problems on most nights, with group membership (with group D as the reference category), controlling for age and gender.

	Number (%)	p-value	OR (95% CI)
Reporting of sleep problems on most nights*			
Group A. RRC and CWP	269 (60%)	**<0.001**	3.07 (2.47, 3.81)
Group B. RRC not CWP	549 (41%)	**<0.001**	1.42 (1.22, 1.64)
Group C. CWP not RRC	441 (59%)	**<0.001**	2.97 (2.48, 3.54)
Group D. Controls not CWP (reference)	573 (32%)		1

* Reporting of sleep problems on most nights χ^2 (5) = 246.72, p<0.001
OR: odds ratio
p-values in bold are less than or equal to 0.05.

Compared to the control group (D. Controls not CWP), all three groups (A. RRC and CWP; B. RRC not CWP; and C. CWP not RRC) were more likely to have worse self-reported mental and physical health (SF-12 mental and physical component scores, SF-36 physical function), more psychological dysfunction (HADs anxiety and depression), and more cognitive impairment. The differences between controls and the other three groups were most marked on the two physical health measures (SF-12 physical component score and SF-36 physical function score). The two groups of patients with self-reported CWP (A. RRC and CWP; C. CWP not RRC) demonstrated worse self-reported health on all measures relative to the control group than for a similar comparison of group B patients (RRCs who did not self-report CWP) to the control group. However, group B patients still demonstrated a significant difference to the control group on self-reported health measures. Individuals both self-reporting CWP and identified as RRCs (Group A. RRC and CWP) were the most severely affected on all measures.

Table 7.12 Results of six multiple linear regression analyses to test for association of group membership with baseline self-reported mental and physical health (SF-12 mental and physical health component scores, SF-36 physical function), cognitive impairment (SIP alertness subscale) and psychological dysfunction (HADS anxiety and depression), controlling for age and gender.

	Beta coefficient (95% CI)	t-statistic for Beta coefficient	p-value for t-test
SF-12 mental component score			
Control vs group A	-6.17 (-7.40, -4.94)	-9.85	**<0.001**
Control vs group B	-3.09 (-3.93, -2.25)	-7.24	**<0.001**
Control vs group C	-5.16 (-6.16, -4.16)	-10.09	**<0.001**
SF-12 physical component score			
Control vs group A	-15.53 (-16.72, -14.34)	-25.61	**<0.001**
Control vs group B	-6.42 (-7.23, -5.61)	-15.56	**<0.001**
Control vs group C	-13.18 (-14.15, -12.21)	-26.65	**<0.001**
SF-36 physical function			
Control vs group A	-36.63 (-39.43, -33.83)	-25.65	**<0.001**
Control vs group B	-13.93 (-15.84, -12.02)	-14.28	**<0.001**
Control vs group C	-32.75 (-35.05, -30.45)	-27.93	**<0.001**
HADS anxiety			
Control vs group A	2.72 (2.30, 3.15)	12.66	**<0.001**
Control vs group B	1.07 (0.78, 1.36)	7.24	**<0.001**
Control vs group C	2.34 (1.99, 2.69)	13.26	**<0.001**
HADS depression			
Control vs group A	2.95 (2.60, 3.31)	16.25	**<0.001**
Control vs group B	1.00 (0.75, 1.24)	8.01	**<0.001**
Control vs group C	2.65 (2.36, 2.94)	17.76	**<0.001**
Cognitive impairment			
Control vs group A	12.79 (10.45, 15.12)	10.75	**<0.001**
Control vs group B	3.99 (2.41, 5.57)	4.94	**<0.001**
Control vs group C	11.46 (9.54, 13.38)	11.71	**<0.001**

Group A. RRC and CWP.
Group B. RRC not CWP.
Group C. CWP not RRC.
Group D. Controls not CWP (reference category).
p-values in bold are less than or equal to 0.05.

7.5 Discussion

The RRC-all definition identified over a third of patients self-reporting persistent widespread pain (baseline and three years: 37% ACR-90, 38% Manchester definition). Between 75% and 86% of RRCs did not report persistent widespread pain (depending on widespread pain and RRC definition) but only a maximum of 3% reported no musculoskeletal pain. The RRC-all definition identified twice as many self-reported widespread pain participants as the RRC-Rohrbeck definition.

For all three RRC definitions sensitivity for self-reported chronic widespread pain was low (RRC-all: 37%–38%; RRC-clinician: 32%; RRC-Rohrbeck: 18%) and specificity high (RRC-all: 80%–81%; RRC-clinician: 84%–85%; RRC-Rohrbeck: 92%). The RRC-all definition was the most sensitive for self-reported CWP, while the RRC-Rohrbeck the most specific.

Respondents who were both RRCs and fulfilled the self-reported CWP criteria had the worst self-reported physical and mental health status, consulted most frequently and were more likely to have somatic symptom consultations. Those fulfilling the CWP criteria who were not RRCs had worse self-reported health status than RRCs who did not fulfill the CWP criteria. However, RRCs who did not fulfill the CWP criteria consulted more frequently and had more somatic symptom consultations than those fulfilling the CWP criteria who were not RRCs.

7.5.1 Association of consultation-based pain status with self-reported pain status

Our first hypothesis was that there is an association between fulfilling RRC criteria and self-reporting chronic widespread pain. Half (53%) of the patients identified by the RRC-all definition had self-reported widespread pain (ACR-90) at either baseline or three years, and a quarter (25%, the positive predictive value) had persistent widespread pain (ACR-90) at both baseline and three years. Thirty-seven percent of respondents with persistent widespread pain (ACR-90 pain at baseline and three years) fulfilled RRC-all criteria. However, 86% of patients not fulfilling the RRC-all definition did not have persistent self-reported widespread pain (ACR-90 at baseline and three years).

The observation that the RRC definition correctly identifies most of those without self-reported CWP (persistent ACR-90 widespread pain on baseline and three year questionnaires) but is less effective at identifying CWP patients, and has a low positive predictive value, might be accounted for by three explanations: i) the self-reported widespread pain definitions used in the study; ii) the spectrum of the chronic pain experience; and iii) the consultation behaviour of CWP patients. Firstly, the widespread pain definitions used in this study. Self-reported chronic widespread pain was determined at two discrete time points separated by a three-year interval potentially missing some widespread pain cases. As the self-reported definition becomes more stringent (widespread pain at baseline *or* three years progressing to a requirement for baseline *and* three years, or ACR-90 widespread pain progressing to Manchester widespread pain) it becomes more likely that cases will be missed. Since RRC status is determined by a continuous five-year review of medical record data it is likely that the RRC definition identifies true CWP patients missed by the self-reported pain measure. This suggests that the sensitivity reported here might be an under-estimate for true CWP.

Secondly, another explanation for the low positive predictive value of RRC status as a measure of widespread pain is related to the theory that ACR-90 defined CWP and FM occupy the more severe end of a spectrum of pain conditions (McBeth and Mulvey 2012). This explanation is supported by the observation that RRCs not reporting persistent widespread pain had fewer somatic symptoms, lower consultation counts, were less likely to be frequent attenders and had better self-reported health than those who did. Further, if we compare patients self-reporting

ACR-90 persistent widespread pain with those satisfying the more exacting Manchester widespread pain definition, we see that the Manchester widespread pain patients have higher consultation rates, more frequent attendance, more recorded somatic symptoms (Table 7.6) and worse self-reported health (Table 7.7). This finding of worse consultation-based and self-reported health in Manchester versus ACR-90 widespread pain patients supports the theory (Macfarlane et al. 1996a) that patients fitting more stringent widespread pain definitions occupy the more severe end of the spectrum of chronic pain syndromes. RRC criteria may identify patients experiencing longstanding diffuse pain who might not necessarily meet the more stringent established CWP criteria.

Finally, consultation behaviour may also explain the low sensitivity of the RRC definition for self-reported widespread pain. The RRC definition only has the capacity to identify those who present to primary care with their musculoskeletal symptoms. Because there is still a group in the general population who do not consult, RRC criteria cannot hope to identify all self-reported widespread pain patients.

By identifying more patients, the RRC-all definition has a higher sensitivity than the RRC-clinician or RRC-Rohrbeck definitions. However, increased sensitivity comes at the cost of reduced specificity. For all three RRC definitions sensitivity is low (less than 40%) and specificity high (over 80%). In order to identify a higher proportion of self-reported CWP cases who are probably at the more severe end of the CWP scale, it would be prudent therefore, to accept a small reduction in specificity as a trade-off for increasing a low sensitivity. This is a potentially persuasive argument for discarding the RRC-clinician and RRC-Rohrbeck code lists in favour of the RRC-all list in future iterations of the RRC definition. However, it is important to consider here the context in which the RRC definition will be applied. In a clinical setting it could be argued that it is more important to identify the maximum number of cases, while in a research setting it may be more important to be sure that those identified fit an established case definition. Consequently, in clinical practice a higher sensitivity may be more important, while in a research setting a high specificity may be the priority.

7.5.2 Comparison of consultation-based and self-reported pain status

Our second hypothesis was that RRCs and CWP patients were more similar to each other than controls. Both consultation-based and self-reported measures of health were worse for RRCs and self-reported CWP (ACR-90 pain at baseline and three years) patients than for consultation-based controls. This suggests that patients fulfilling either consultation-based or self-reported CWP criteria have worse subjective health than patients who only consult for problems in a single region. The consistency between the health profile of RRCs and that of self-reported widespread pain patients supports the RRC definition as a measure of CWP.

Our final hypothesis was that individuals with self-reported CWP (ACR-90 pain at baseline and three years) not fulfilling the RRC definition would be more likely than RRCs not fulfilling the CWP criteria to have more severe symptoms (worse self-reported health, cognitive impairment, sleep complaints and psychological dysfunction) and less likely to be frequent attenders (lower consultation rates and levels of frequent attendance). This was found to be the case. The improved self-reported health of these RRCs without self-reported CWP might indicate a group of patients with a less severe form of CWP. Cognitive impairment and sleep problems are features associated with FM and CWP (Glass 2006, Mease et al. 2005, Wolfe et al. 2010). Our finding of better cognitive function and fewer sleep problems in RRCs not self-reporting CWP compared to CWP patients might suggest that either some RRCs are less likely to fit the FM/CWP profile, or that these RRCs represent either a less severe point on the chronic pain spectrum, or a pre-disease manifestation of CWP.

7.5.3 Strengths and limitations

a. Study population

The study population was taken from a sampling frame of those aged 50 years and over only. This is likely to limit the generalisability of the findings. RRC prevalence was higher for the over 50 age group presented (2,155 per 10,000 population) in this study than that observed in the previous chapter for all ages (1,149 per 10,000). This finding is consistent with the observations of the systematic review (Chapter Three), where it was noted that CWP prevalence increased from middle-age. In Chapter Five we demonstrated that RRCs aged over 45 had similar numbers of non-musculoskeletal consultations (section 5.4.3.a) and somatic symptoms (section 5.4.4) than RRCs of all age groups, suggesting that the findings of this chapter may be relevant to all age groups; however, we must be cautious in attributing our findings to all those with or at risk of CWP.

Less than a third of the eligible population (i.e. all those invited to take part in the baseline study) were included in the analysis, we cannot therefore exclude the risk of participation bias. However, differences between the study population, and non- or partial-responders were demonstrated to be small on all variables assessed.

Non-responders at baseline were older (mean difference = 0.86, 95% CI: 0.53, 1.18) and more likely to be male (non-responders: 49% male; study population: 46% male) than the study population, however differences were small and unlikely to affect the generalisability of the findings.

There were small differences between the study population and incomplete responders (responders to baseline only, or responders to baseline and three years without access to five years of medical record data). Compared to incomplete responders the study population was younger, more likely to be married or cohabiting, more likely to be in paid employment, with less deprivation, from a higher social class, with better self-reported mental and physical health (SF-12 mental and physical component score, SF-36 physical function, HADS anxiety and depression score, and SIPS cognitive impairment score) and more self-reported pain. However, the small magnitude of the observed differences suggests that they are unlikely to affect the generalisability of the findings.

b. Outcome measures

The body-pain manikin included in the health questionnaires asked patients to note the location of any body pain experienced in the last four weeks. Without a measure of chronicity we measured widespread pain at a two levels: i) widespread pain at baseline or three years; and ii) persistent widespread pain at both baseline and three years. Neither provides an accurate measure of chronicity. However, the prevalence of ACR-90 widespread pain (defined as at baseline and three years) in the study population was 1,400 per 10,000, which is comparable to CWP prevalence estimates for the older population from previous studies (Eggermont et al. 2010: 910 per 10,000 in those over 70; Santos et al. 2010: 1,400 per 10,000 in those over 65). Further, patients with widespread pain at baseline or three years demonstrated similar levels of anxiety and depression to those found in CWP patients in another study (McBeth et al. 2005).

Comparing widespread pain measured at discrete time points against a continuous measure of consultation-based widespread pain also presents problems. While truly persistent widespread pain will be picked up by the two measures at a three-year interval, new CWP patients or patients with relapsing and remitting CWP might be missed. This suggests estimates of sensitivity and PPV may therefore be higher than those observed in this study.

Problems with using consultation-based measures of health (consultation count, somatic symptom count, frequent attendance) were discussed in Chapter Five (section 5.5.6 f–h). While these measures are not a true reflection of health, they do offer a useful indicator of the relative burden of ill-health and a picture of consulting practices. Similarly, self-reported health measures can only offer a subjective assessment of health status not a true reflection of health, but again they offer a useful indicator in this instance for subjective distress.

7.6 Conclusions

Fulfilling the RRC criteria was associated with worse consultation-based health (more consultations, more frequent attendance) than CWP status, but CWP status was associated with worse self-reported health than RRC status. This suggests that RRCs are frequent consulters who share features with CWP patients, but perhaps some may be less severely affected and therefore do not necessarily fit established and strict CWP criteria.

However, these patients still have a clinical need, as demonstrated by their high consultation demands. We could argue therefore that the RRC definition is a more useful means of identifying a clinically important group of patients than whether they meet the arbitrary cut-off point set by established CWP criteria. The diagnostic cut-off of established criteria fails to recognise the continuum of the pain experience and therefore excludes some of the less severe cases (who are still expressing an arguably unmet need) picked up by the RRC definition. Indeed recognising the less severe cases identified by the RRC definition might offer us an opportunity of providing effective management before a patient progresses to meeting the more strict established CWP definitions. Previous research (McBeth et al. 2001a and 2001b) has identified risk factors associated with persistent CWP, and modifying these risk factors in patients with 'pre-CWP' may halt the progression to persistent CWP.

If the RRC definition is to be used clinically we must be very clear about the patient group that is being identified. A low sensitivity means that many of those with self-reported CWP will be missed by the RRC definition, while a low PPV means that many RRCs will not meet strict ACR-90 CWP criteria. The RRC definition identifies a heterogeneous group of frequent consulters with predominantly musculoskeletal symptoms, including those less severely affected who do not therefore necessarily fit established and strict CWP criteria. They nonetheless still exist on the spectrum of polysymptomatic distress characteristic of CWP and FM. The RRC definition might therefore have an important application as a tool to identify high-risk patients (i.e. patients at risk of progression towards the more severe end of the CWP/FM spectrum) in situations where reduced continuity of care may hinder a clinician's ability to perceive a history of repeated musculoskeletal consultations as evidence of a more generalised condition.

Identifying and offering appropriate management for currently unrecognised generalised pain conditions has the potential to improve patient outcomes and reduce consultation rates. The next chapter will therefore establish whether RRCs can be identified in a shorter timeframe and continue work to develop a severity scale for use within the existing RRC definition.

Chapter 8
Time taken to identify recurrent regional consulters

8.1 Introduction

In the previous chapter we demonstrated that RRCs had similar characteristics to individuals with self-reported CWP. However, since RRCs without self-reported CWP had better self-reported health than people self-reporting CWP but not fulfilling the RRC criteria, we postulated that fulfilling the RRC criteria might represent a less severe point on the chronic pain spectrum. If this is the case it is hoped that identifying RRCs early and before their condition becomes severe would provide the opportunity to intervene to manage risk factors and halt the progression to persistent CWP, which may be associated with greater health problems (McBeth et al. 2001a). It would be helpful therefore to identify RRCs earlier than the current five-year period needed in the case definition. Previously the RRC criteria have been used retrospectively to identify how many patients in the previous five years have fulfilled the criteria. It would be useful to establish how quickly RRCs can be identified prospectively as patients could then be followed forward until they fulfilled the criteria at which point their status could be flagged to their GP.

This chapter therefore first aims to determine the proportion of RRCs who can be identified after three and four years and to compare RRCs identified after three and four years with those identified in the five years imposed by the Rohrbeck-2007 RRC definition.

Current RRC criteria require a minimum of three years to identify a RRC, based on need for a regional consultation in three separate years, if this requirement were removed then RRCs could potentially be identified more quickly. This chapter therefore also investigates how much adapting the established criteria (by removing the requirement for regional consultation in three separate years) influences the time taken to identify a RRC and how many false positives are then identified (i.e. the number of extra patients fulfilling the criteria when the requirement for a regional consultation in three separate years is removed).

8.2 Aims and objectives

The primary aim of this chapter is to establish whether RRCs can be identified in less time than the five years required by the established RRC definition to allow for earlier identification.

Specifically, the objectives of the chapter are:

1. To assess how many patients fulfilling the RRC criteria would be missed if the criteria were revised to three or four years rather than five years.

2. To establish whether those fulfilling RRC criteria earlier are those with more severe problems.

3. To establish how much sooner RRCs can be identified if the requirement for regional consultations in each of three separate years were removed from the RRC criteria

4. To investigate how many more patients would be identified if the requirement for regional musculoskeletal consultations in each of three separate years were removed.

5. To compare the consultation-based health profile of the extra RRCs identified by removing the separate years criterion to that of RRCs identified using the established Rohrbeck-2007 definition, to establish whether the extra patients identified still fit the RRC profile.

8.3 Methods

8.3.1 Study population

RRCs were identified from all patients (no age restriction) fully registered with the 12 primary care practices in the CiPCA dataset between the years 2005 and 2009. To fulfil the aim of this analysis to assess the feasibility of earlier identification of RRCs, as a slight variation to previous chapters, we only considered patients who had a regional musculoskeletal complaint in 2005 (the first year of the five-year period). The first such regional consultation in 2005 was labelled as the index consultation. RRCs were identified using the Rohrbeck-2007 criteria (see Table 8.1) with the list of all regional musculoskeletal Read codes (RRC-all). RRCs were identified from those recorded as consulting for a regional musculoskeletal complaint in 2005.

Table 8.1 RRC definition used in this analysis.

From and including their index regional musculoskeletal consultation, fulfil all of i)–iv).
i) at least 1 consultation for a musculoskeletal complaint in the axial skeleton (neck & back);
ii) at least 1 consultation for an upper or lower limb complaint;
iii) at least 1 consultation for a regional musculoskeletal complaint in each of 3 separate years;
iv) at least 4 consultations for regional musculoskeletal complaints in total during the 5 year period.

8.3.2 Analysis 1: RRCs identified in shorter timeframes

RRCs were identified over the five-year period who had an index regional musculoskeletal consultation in 2005. We determined the percentage of these RRC patients who fulfilled the RRC criteria: i) within three years; ii) between three and four years; and iii) after four years from their index regional musculoskeletal consultation date in 2005. These three groups were then compared on age, gender, mean number of somatic symptoms, percentage who were non-musculoskeletal frequent attenders, and their mean number of musculoskeletal and non-musculoskeletal consultations.

Somatic symptom count was calculated as before (see Chapter Five, section 5.3.4) using 340 Read codes corresponding to 40 physical symptoms (Read codes presented in appendix 5.3, Table A5.4). For each patient, the number of somatic symptoms consulted for in the period 2005 to 2009 was calculated. The mean number of somatic symptoms was then calculated for each patient group.

Non-musculoskeletal frequent attenders were defined as before (see Chapter Five, section 5.3.5) as the top 10% of attenders in each practice for non-musculoskeletal problems. The percentage of non-musculoskeletal frequent attenders and the mean number of musculoskeletal and non-musculoskeletal consultations between 2005 and 2009 was calculated for each group of patients.

To test for differences between the RRCs identified within three years, between three and four years, and between four and five years, unadjusted and adjusted odds ratios for age group, gender, frequent attender status (top 10% of attenders for non-musculoskeletal complaints) and recording of one or more somatic symptoms were calculated using multinomial logistic regression with three subgroups of RRCs defined by the time at which RRC criteria are fulfilled (i. at 3 years; ii. 3–4 years; and iii. 4–5 years) as the dependent variable. Analyses were undertaken using SPSS (IBM 2011). RRCs identified between four and five years (i.e. those taking the longest to fulfill criteria) were used as the reference category. Age group was defined using the following age bands 14 and under; 1524; 25–44 (reference); 45–64; 65–74; and 75+.

8.3.3 Analysis 2: Removing requirement for regional consultations in three separate years

a. Extra RRCs identified

This analysis removed the requirement for regional consultations in each of three separate years. RRCs were again identified from an index regional musculoskeletal consultation in 2005 but without the requirement of regional complaints in three separate years. The number of extra patients identified by removing the requirement for consultations in three separate years was determined.

To establish whether removing the separate years requirement influenced how soon RRCs were identified we categorised RRCs identified using adapted criteria (without the requirement for consultations in three separate years) into yearly intervals based on the time to fulfillment of criteria (from one year from index consultation to five years from index consultation). We cross-tabulated these categories against the classification used in analysis one based on the full criteria (fulfilled within: three years; three to four years; and four to five years of index consultation). This allowed us to calculate what percentage of RRCs identified using established criteria would be identified at yearly intervals if the requirement for consultation in separate years were removed.

b. Comparison of established RRCs with extra RRCs

RRCs identified using the established Rohrbeck-2007 criteria were compared descriptively with the extra RRCs identified by removing the separate years criterion, and with a control group. The following groups were compared on age, gender, mean number of somatic symptoms, percentage of non-musculoskeletal frequent attenders, and mean number of musculoskeletal and non-musculoskeletal consultations:

A. RRCs identified using established criteria.

B. The additional patients added to those identified using established Rohrbeck-2007 criteria (A) by removing the requirement for regional consultations in separate years.

C. Controls recorded as consulting for a musculoskeletal problem in only one of three body regions (axial, upper limb or lower limb) during the five-year period (2005–2009) (described in section 5.3.1).

Consultation-based health measures (somatic symptom count, frequent attendance, and musculoskeletal and non-musculoskeletal consultation count) were measured as described above (section 8.3.2).

8.4 Results

8.4.1 Analysis 1: RRCs identified in shorter timeframes

A total of 6,088 RRCs with an index regional musculoskeletal consultation in 2005 were identified using established RRC Rohrbeck-2007 criteria over the five-year period. Forty-eight percent (n=2,900) of RRCs were identified within three years of the index musculoskeletal consultation and 83% (n=5,062) were identified within four years of the index consultation date.

RRCs identified at three or four years had higher non-musculoskeletal consultation counts and more recorded somatic symptoms than those identified over the full five years (see Table 8.2).

Table 8.2 Age and gender distribution, and consultation-based health of RRCs identified at 3, 4 and 5 years from index consultation.

	Mean age (sd)	**Female (%)**	**FAs (%)**	**Somatic symptom count**		**Non-MS consultation count**		**MS consultation count**		**Total**
				Mean (sd)	Median (IQR)	Mean (sd)	Median (IQR)	Mean (sd)	Median (IQR)	
RRC within 3 years	60 (16)	63%	40%	3.19 (2.29)	3 (1, 5)	56 (38)	50 (30, 74)	14 (9)	12 (8, 18)	**2,900**
RRC after 3 and before 4 years	59 (17)	59%	30%	2.72 (2.09)	2 (1, 4)	49 (33)	42 (25, 64)	10 (6)	9 (6, 12)	**2,162**
RRC after 4 and before 5 years	57 (17)	60%	26%	2.41 (1.95)	2 (1, 3)	44 (30)	37 (23, 58)	8 (5)	7 (5, 10)	**1,026**
RRC using established Rohrbeck-2007 criteria (2005 to 2009)*	59 (17)	61%	34%	2.89 (2.19)	2 (1, 4)	52 (35)	44 (27, 68)	12 (8)	10 (7, 15)	**6,088**

*RRCs identified in the five years from index consultation in 2005, includes all RRCs identified in the three rows above.
FA: top 10% of non-musculoskeletal frequent attenders.
MS: musculoskeletal
sd: standard deviation
IQR: interquartile range

Results of a multinomial logistic regression analysis comparing RRCs identified within three years, between three and four years, and between four and five years are shown in Table 8.3. Adjusting for age and gender, RRCs identified within three years had nearly twice the odds (OR = 1.76, 95% CI 1.49, 2.08), compared to those identified between four and five years, of being frequent attenders, and were more likely to have a least one recorded somatic symptom (OR=1.36, 95% CI 1.09, 1.69). RRCs identified between three and four years were also more likely to be frequent attenders (OR = 1.18, 95% CI 0.99, 1.40) and to have at least one recorded somatic symptom (OR = 1.26, 95% CI 1.01, 1.58) than those identified after four years. There was no significant difference in age and gender between RRCs identified before four years, and those identified after four years.

Table 8.3 Multinomial logistic regression analysis of RRCs identified within 3 years and between 3 and 4 years with RRCs identified between 4 and 5 years as the reference category – adjusted and unadjusted odds ratios.

		Reference group RRC identified between 4 and 5 years	RRC identified between 3 and 4 years			RRC identified within 3 years		
		n (%)	n (%)	Unadjusted OR (95% CI)	Adjusted OR* (95% CI)	n (%)	Unadjusted OR (95% CI)	Adjusted OR* (95% CI)
Gender	**Male**	416 (40%)	892 (41%)	1	1	1,076 (37%)	1	1
	Female	610 (60%)	1,270 (59%)	0.97 (0.83, 1.13)	0.93 (0.79, 1.08)	1,824 (63%)	1.16 (1.00, 1.34)	1.04 (0.89, 1.20)
FA status	**No**	760 (74%)	1,511 (70%)	1	1	1,738 (60%)	1	1
	Yes	266 (26%)	651 (30%)	**1.23 (1.04, 1.46)**	1.18 (0.99, 1.40)	1,162 (40%)	**1.91 (1.63, 2.24)**	**1.76 (1.49, 2.08)**
Somatic symptoms	**No**	144 (14%)	240 (11%)	1	1	269 (9%)	1	1
	Yes	882 (86%)	1,922 (89%)	**1.31 (1.05, 1.63)**	**1.26 (1.01, 1.58)**	2,631 (91%)	**1.60 (1.29, 1.98)**	**1.36 (1.09, 1.69)**
Age group	**<14**	5 (1%)	5 (0%)	0.52 (0.15, 1.82)	0.53 (0.15, 1.86)	3 (0%)	0.26 (0.61, 1.09)	0.30 (0.07, 1.25)
	15–24	38 (4%)	85 (4%)	1.15 (0.76, 1.75)	1.16 (0.76, 1.77)	54 (2%)	0.61 (0.39, 0.96)	0.64 (0.41, 1.00)
	25–44	193 (19%)	371 (17%)	1	1	449 (16%)	1	1
	45–64	426 (42%)	848 (39%)	1.04 (0.84, 1.28)	1.04 (0.84, 1.28)	1,176 (41%)	1.19 (0.97, 1.45)	1.18 (0.97, 1.45)
	65–74	185 (18%)	442 (205)	1.24 (0.97, 1.59)	1.23 (0.95, 1.56)	611 (21%)	1.42 (1.12, 1.80)	1.33 (1.05, 1.68)
	75+	179 (17%)	412 (19%)	1.20 (0.94, 1.53)	1.15 (0.90, 1.48)	607 (21%)	1.46 (1.15, 1.85)	1.26 (0.99, 1.60)

FA: Top 10% non-musculoskeletal frequent attender
OR: odds ratio
* Adjusted for all presented variables.

8.4.2 Analysis 2: Removal of requirement for regional consultations in three separate years

a. Extra RRCs identified

An additional 1,618 RRCs were identified when the requirement for a regional musculoskeletal consultation in each of three separate years was removed, representing a 27% (1,618/6,088) increase on the RRCs identified using the established Rohrbeck-2007 RRC criteria. Seventy-nine percent (6,088/7,706) of RRCs identified when the separate years requirement was removed met established Rohrbeck-2007 criteria.

Table 8.4 cross-tabulates the Rohrbeck-2007 RRCs identified at: i) three years; ii) between three and four years; and iii) between four and five years, against RRCs identified without the requirement for regional complaints in three separate years who were identified at: i) one year; ii) between one and two years; iii) between two and three years; iv) between three and four years; and v) between four and five years. This shows that the adapted criteria identify RRCs sooner.

Table 8.4 Cross tabulation of Rohrbeck-2007 RRCs identified at yearly intervals from 3 to 5 years with RRCs identified without the requirement for regional consultations in separate years identified at yearly intervals from 1 to 5 years (row percentages).

	RRCs identified without the requirement for regional consultations in each of three separate years					
	At 1 year	At 1 to 2 years	At 2 to 3 years	At 3 to 4 years	At 4 to 5 years	**Total**
Not Rohrbeck-2007 RRC	562 (35%)	331 (20%)	281 (17%)	312 (19%)	132 (8%)	**1,618**
Rohrbeck-2007 RRC:						
At 3 years	807 (28%)	1,188 (41%)	905 (31%)	0 (0%)	0 (0%)	**2,900**
At 3 to 4 years	401 (19%)	351 (16%)	413 (19%)	997 (46%)	0 (0%)	**2,162**
At 4 to 5 years	126 (12%)	107 (10%)	81 (8%)	128 (12%)	584 (57%)	**1,026**
Subtotal: all RRCs	1,334 (22%)	1,646 (27%)	1,399 (23%)	1,125 (18%)	584 (10%)	**6,088**
Total	**1,896 (25%)**	**1,977 (26%)**	**1,680 (22%)**	**1,437 (19%)**	**716 (9%)**	**7,706**

At one year the criteria without the requirement for regional consultations in separate years identified 28% of Rohrbeck-2007 RRCs who would not have been identified until three years with established criteria, 19% of those who would not have been identified until four years, and 12% who would not have been identified until five years. This increases to 69%, 35%, and 22% (cumulative percentages) respectively at two years.

If the requirement for regional consultations in separate years is removed, then 22% of all established RRCs (i.e. RRCs identified using the established Rohrbeck-2007 criteria, including the separate years requirement) were identified one year from an index musculoskeletal consultation,

and this would include those RRCs most severely affected (see analysis 1), but at the cost of an extra 562 (35%) of patients who do not fulfil the full criteria. Further, of all established RRCs, if the requirement for regional consultations in separate years were removed, 49% were found within two years, 72% in three, and 90% in four (see Table 8.5).

For all RRCs identified by removing the requirement for regional consultations in three separate years, 25% of RRCs were found within a year, 50% in two years, 72% in three (contrasted with 48% of established RRCs identified using full criteria found at three years), and 91% in four (contrasted with 83% of established RRCs identified using full criteria found at four years).

Table 8.5 Cumulative number (%) of RRCs identified by year from earliest time point for identification.

	Number (%) of RRCs identified by year					
	Within 1 year	At 2 years	At 3 years	At 4 years	At 5 years	**Total**
Rohrbeck-2007 RRC	-	-	2,900 (48%)	5,062 (83%)	6,088 (100%)	**6,088**
RRCs[a] identified when separate years requirement removed	1,334 (22%)	2,980 (49%)	4,379 (72%)	5,505 (90%)	6,088 (100%)	**6,088**
RRC-amended-critera[b]	1,896 (25%)	3,873 (50%)	5,553 (72%)	6,990 (91%)	7,706 (100%)	**7,706**

a. Those RRCs fulfilling the original criteria only;
b. All RRCs identified when removing separate years requirement.

b. Comparison of established RRCs with extra RRCs

The additional patients identified by removing the requirement for regional musculoskeletal consultations in each of three separate years were slightly younger, less likely to be female, less likely to be frequent attenders, and had fewer somatic symptoms and lower consultation rates than RRCs identified using established criteria (see Table 8.6). However, they were clearly different from the control group on these variables.

Table 8.6 Age and gender distribution, frequent attendance, somatic symptom count and five-year musculoskeletal and non-musculoskeletal consultation counts for RRCs identified using established Rohrbeck-2007 RRC criteria and additional patients identified by removing the requirement for regional musculoskeletal consultations in three separate years.

	Mean age (sd)	Female (%)	FAs (%)	Somatic symptom count		Non-MS consultation count		MS consultation count		Total
				Mean (sd)	Median (IQR)	Mean (sd)	Median (IQR)	Mean (sd)	Median (IQR)	
A. RRC using established Rohrbeck-2007 criteria	59 (17)	61%	34%	2.89 (2.19)	2 (1, 4)	52 (35)	44 (27, 68)	12 (8)	10 (7, 15)	**6,088**
B. Additional RRCs added to A if separate years criterion removed	56 (17)	55%	20%	2.06 (1.81)	2 (1, 3)	39 (30)	32 (17, 52)	7 (4)	6 (4, 8)	**1,618**
C. Control (single-region consulters)	46 (21)	50%	7%	1.22 (1.35)	1 (0, 2)	20 (17)	16 (8, 28)	2 (2)	1 (1, 2)	**20,499**

FA: top 10% of non-musculoskeletal frequent attenders.
MS: musculoskeletal
sd: standard deviation
IQR: interquartile range

8.5 Discussion

Nearly half (48%) of all RRCs could be identified within three years of an initial regional musculoskeletal consultation and 83% identified within four. RRCs identified earlier had more severe consultation-based health (more recorded somatic symptoms, more consultations, and more likely to be a frequent attender).

If the requirement for regional consultations in three separate years is removed from the RRC definition 27% more RRCs are identified. Removing the requirement for regional consultations in separate years leads to earlier identification of RRCs; 72% of RRC-all are identified within three years in contrast to only 48% using the established Rohrbeck-2007 criteria. However, the extra RRCs identified by adapting the RRC consultation pattern have a different consultation-based health profile from that of RRCs identified using established criteria; they have fewer somatic symptoms, are less likely to be frequent attenders, and have fewer non-musculoskeletal consultations.

8.5.1 RRCs identified in shorter timeframes

The high percentage of patients identified within three to four years of the index musculoskeletal consultation suggests that the timeframe for RRC identification can be shortened. Whether the timeframe for identification should be shortened, however, depends on the context in which the criteria are used. If the intention is to use the criteria retrospectively (to identify research subjects or patients at the practice currently unrecognised as having CWP with a view to clinical intervention), then reducing the timeframe over which RRCs are identified could potentially halve the number of RRCs picked up. Without the need for a speedy diagnosis, there seems no justification for reducing the timeframe over which a RRC can be identified. However, since RRCs identified over shorter timeframes have been demonstrated to have more severe consultation-based health (and therefore greater clinical need) than those identified over longer timeframes, it is therefore arguably important in a clinical setting to identify patients (perhaps via an electronic flag in the computer system) as soon as they meet the RRC consultation criteria. Previous research (McBeth et al. 2001a) has shown that patients with features of somatisation are more likely to have persistent widespread pain and that persistent widespread pain patients are more likely to make more frequent consultations for disruptive symptoms; this suggests that the RRCs

we found in shorter timeframes, who had more recorded somatic symptoms and more frequent attendance, are perhaps those at most risk of developing persistent widespread pain. Clinically, therefore, identifying these more severe early RRCs promptly, before their condition becomes truly chronic, is a priority. Earlier identification would allow more timely clinical evaluation and if necessary therapeutic intervention as soon as the criteria permit, and potentially halt progression to a more persistent state.

8.5.2 Regional consultations in separate years

Removing the requirement for regional consultations in three separate years decreases the time taken to identify a RRC, but it identifies extra patients (27% more RRCs are identified) who do not necessarily fit the RRC consultation profile. Again, the important consideration here is the context in which the RRC criteria will be applied. When using the RRC definition to identify individuals for participation in research the focus should be on identifying patients accurately. In a research setting the time necessary to identify a RRC will be less important than the ability to identify a patient accurately fitting the RRC/CWP profile. However, in a clinical context, flagging a patient with potential CWP quickly is perhaps more important than definitive diagnosis. A software prompt would serve as an indication to a doctor to use their clinical judgement to consider a CWP/FM diagnosis in patients fulfilling RRC criteria, offering an opportunity for timely intervention if appropriate.

Removing the separate years criterion might therefore be appropriate in clinical practice as an electronic flag for clinicians to consider a CWP diagnosis, but inappropriate in a research context.

8.5.3 Strengths and limitations

a. Study population

The study population is the same as that used in Chapters Five and Six where we have already discussed the limitations of studying only those fully registered for a five-year period and the geographical limitations of the CiPCA dataset and suggested that this may only have a small influence on generalisability.

b. RRC identification

In this study we have identified RRCs from an index consultation in 2005. This has allowed us to compare RRCs identified within different periods of time from an index musculoskeletal consultation. We have also been able to evaluate what proportion of RRCs can be identified earlier by adapting RRC criteria by removing the separate years criterion.

However, by identifying RRCs based on consultations in one specific five-year period we may have missed patients already fulfilling RRC criteria based on their earlier consultation patterns. By not examining data from 2001 to 2005 we have no way of knowing if patients had already fulfilled RRC criteria. Ideally this analysis should have been undertaken in a group known to yet to fulfil RRC criteria.

c. Consultation-based health measures

The consultation-based measures of health (consultation count, somatic symptom count, frequent attendance) we have used in this chapter have been used previously in Chapters Five, Six and Seven. We have therefore already discussed that these measures are not a true reflection of actual health, but offer a useful indicator of the relative burden of disease and consultation behaviour.

8.6 Conclusions

RRCs identified earlier appear to be affected more severely, with more recorded somatic symptoms and higher consultation frequency.

Current criteria require a minimum of three years for RRC identification; this can be reduced by removing the need for regional consultations in three separate years. However, while generally more similar to established RRCs than to single-region consulters, the extra 27% of patients identified by removal of this part of the criteria have a less severe consultation profile than established Rohrbeck-2007 RRCs, and as a result might be less likely to self-report CWP. It could be argued that the benefits of earlier identification of RRCs in clinical practice are worth the price of reduced specificity. However, in a research context, where there is less need for early diagnosis, the emphasis should remain on accurate patient identification using the full criteria.

The next chapter will use the full updated RRC definition (Rohrbeck-2007 consultation pattern with all regional musculoskeletal Read codes) to further characterise RRCs in terms of demographics and changes in health and pain over time.

Chapter 9
Characteristics of recurrent regional consulters and changes in health over time

9.1 Introduction

Previous chapters have developed and validated the RRC definition. This chapter aims to apply the RRC definition to further explore the characteristics of RRCs and their changes in health over time. With the intention of further investigating whether RRCs fit the profile of CWP patients, and to help us better understand RRCs to offer insights into how best to intervene to improve their health.

We aimed to investigate whether RRCs share socio-demographic and self-reported health features with CWP patients, in order to provide further evidence to support the hypothesis that RRCs fit the profile for CWP. Additionally, to note in what respects the profile of RRCs might differ from that of CWP to better understand where RRCs fit within a spectrum of chronic pain and polysymptomatic distress which is characteristic of FM and CWP (Häuser et al. 2009c).

Previous studies of self-reported FM and CWP have shown that the following features are associated with CWP: increased reporting of sleep problems (Aggarwal et al. 2006), cognitive impairment (Wolfe et al. 2013), increased body mass index (Macfarlane et al. 2009a, Walitt et al. 2011), low socioeconomic status (Macfarlane et al. 2009a, Assumpção et al. 2009, Wolfe et al. 2013), poor social function (Wolfe et al. 2013), poor self-reported mental and physical health (Häuser et al. 2009c, Walitt et al. 2011, Wolfe et al. 2013), and little change in self-reported pain and health over time (Walitt et al. 2011). The research presented in this chapter therefore aimed to test these characteristics of CWP patients in RRCs in order to explore similarities and differences to better appreciate where recurrent regional consulters sit in relation to CWP.

To help us better understand RRCs, in order to offer insight into possible risk factors and perhaps suggest how best to intervene to improve their health, we also aimed to explore the profile of RRCs in more detail. Specifically whether RRCs experience more social inequality (e.g. tend to be more deprived), their perceptions regarding the causes of disease, whether their health continues to deteriorate or has plateaued, and whether there are modifiable factors (e.g. social isolation, social inequalities, illness perceptions) which might prevent RRC.

In this chapter therefore, we used the RRC-all definition (original Rohrbeck-2007 criteria with all regional musculoskeletal Read codes) to identify RRCs, and we compared their socio-demographic status, their illness perceptions, and how their self-reported health and pain change over time to a control group who were recorded as consulting for single-site problems.

9.2 Aims and objectives

The primary aims of this chapter were to investigate the socio-demographic characteristics of RRCs and their changes in self-reported health and pain over time.

Specifically:

1. To test whether demographic (age, gender, marital status, living alone status) and socioeconomic (social class, employment status, social network and deprivation) characteristics of RRCs fit those observed in CWP patients.

2. To determine the baseline body mass index of RRCs, since research has identified an association between increased body mass index (BMI) and CWP (VanDenKerkhof et al. 2011)

3. To explore RRCs' perceptions regarding the causes of disease at baseline.

4. To investigate how self-reported mental and physical health of RRCs changes over the time.

5. To investigate changes in self-reported pain in RRCs over time.

9.3 Methods

This chapter, like Chapter Seven, uses data from the North Staffordshire Osteoarthritis Project (NorStOP), a prospective cohort study of community-dwelling adults aged 50 years and over (Thomas et al. 2004). Three cohorts (NorStOP 1: 2002; NorStOP 2: 2003; NorStOP 3: 2004, 2005) were identically recruited and measured via postal surveys of all patients aged 50 years and over registered with eight North Staffordshire general practices (see Chapter Seven, section 7.3.1 for further information). Health surveys were sent at baseline and consenting responders were followed up with repeat questionnaire at three years and six years. Responders were asked for consent for medical record review.

Responders to baseline and three year follow-up health surveys were used to investigate the demographics and illness perceptions of RRCs. Changes over time in self-reported health and pain in RRCs were assessed in those who responded at baseline, three, and six years.

9.3.1 Analysis 1: Demographics, socioeconomic characteristics and illness perceptions at baseline

This part of the study uses the same sample of the NorStOP cohort used in Chapter Seven, that is: responders to baseline and three-year health surveys consenting to medical record review with access to a minimum of five years of medical record data. The study sample was investigated for possible participation bias in Chapter Seven (section 7.4.1.a) and it was concluded that while non-responders at baseline were significantly older and more likely to be male than the study population, differences were small and unlikely to affect generalisability.

We identified RRCs using the established Rohrbeck-2007 criteria (see Chapter Five, section 5.3.1, Table 5.1) using all regional musculoskeletal Read codes (see appendix A5.2) applied to the five years of medical record data starting two years prior to the baseline health questionnaire. Controls were those used in previous chapters, that is, individuals recorded as consulting for only one of the three body regions specified in the RRC criteria (axial, upper limb or lower limb) over the five years starting two years prior to the baseline health questionnaire.

RRCs and controls were compared on age, gender, marital status, whether they lived alone, current employment status, social class, deprivation, body mass index (BMI), social network, and

illness perceptions at baseline (Table 9.1). RRCs have already been compared to controls on SF-12 mental and physical component summary scores, SF-36 physical function score and HADS anxiety and depression scores in Chapter Seven, section 7.4.3.

Table 9.1 Measures of self-reported health, social networks and illness perceptions.

Outcome measure		Score range	High score	Reference
SF-12	12 item short form health survey physical and mental component summary scores.	0–100	Best health	Ware et al. 1996
SF-36	8 item short form health survey physical functioning subscale.	0–100	Best health	Ware et al. 1992
HADS	Hospital anxiety and depression scale.	0–21	Worst health	Zigmond and Snaith 1983
Berkman-Syme SNI	Social network index, 4 levels of social connection: 'Most integrated' to 'Most isolated.'	1–4	Most integrated	Berkman and Syme 1979
IPQ(R)	The revised illness perceptions questionnaire, causal component. Separated into scores for four different causes of illness: psychological attributes, risk factors, immunity, and accident or chance.			Moss-Morris et al. 2002
	• Risk factor attribution score	7–35	Belief in specified attributes causing condition	
	• Psychological attribution score	6–30		
	• Immunity attribution score	3–15		
	• Accident/chance attribution score	2–10		

Body mass index (BMI) is a crude measure used to establish if an individual is under or over weight. BMI is calculated as self-reported mass in kilograms divided by height in metres squared. A BMI between 19 and 25 is considered a healthy weight and one over 30 is considered obese (WHO 2000). Deprivation was measured using the Index of Multiple Deprivation (Payne and Abel 2012).

Marital status, employment status, social class, and living alone were established by calculating the percentage of RRCs or controls married or cohabiting, in paid employment, living alone, and in high, middle or low social class. Social class was determined using Office for National Statistics (ONS) social class definitions (2005). High social class was determined to be those fitting ONS defined higher managerial or higher professional classifications. Middle class were those in ONS intermediate self-employed occupations, and low class were those fitting lower supervisory/ technical, semi-routine or routine occupations.

Level of social connection was assessed using the Berkman-Syme social network index (1979) which evaluates four levels of social connection from the 'most integrated' to the 'most isolated.' The social network index considers the number of social ties and their relative importance, for example contact with friends and relatives is weighted more heavily than group membership. We calculated the percentage of RRCs and controls who were in the two most isolated groups (groups one and two) and those in groups with the most social integration (groups three and four).

Illness perceptions of RRCs and controls were investigated using the revised illness perceptions questionnaire (IPQ(R) Moss-Morris et al. 2002) causal component. This provides scores for beliefs about four different causes of illness: psychological, risk factors, immunity, and accident or chance.

Differences in baseline age, BMI, deprivation score, and the four causes of illness from the IPQ(R) for RRCs and controls were tested using t-tests. Differences between RRCs and controls on the dichotomous outcomes: marital status, employment status, living alone, and social network were investigated using chi-squared tests. Social class differences between RRCs and controls were investigated with logistic regression.

9.3.2 Analysis 2: Changes in self-reported health and pain over time

For this section of the study we restricted the analysis to the subgroup of those included in Analysis One above who also responded to the six year follow-up questionnaire (i.e. responders to baseline, three- and six-year health surveys, and consenting to medical record review with access to a minimum of five years of medical record data).

As for Analysis One, RRCs and single-region controls were defined using medical records for the five years starting two years prior to the baseline health questionnaire.

a. Participation bias

Potential participation bias was examined by comparing those in Analysis One who also responded at six years to those who did not. Comparisons were made on age, gender, marital status, employment status, deprivation, and baseline self-reported health and pain.

b. Changes in self-reported health

We investigated changes in SF-36 physical function score, SF-12 mental and physical component scores, and HADs anxiety and depression scores over time, by calculating the mean difference between: i) baseline and three-year scores; and ii) between baseline and six-year scores for RRCs and controls. We tested for differences between RRCs and controls by comparing the mean difference between baseline and three-year scores, and baseline and six-years scores, using independent t-tests for each self-reported health variable.

c. Changes in self-reported pain

We evaluated changes in self-reported pain over time by making a descriptive comparison of the prevalence of: i) any self-reported pain; ii) ACR-90 widespread pain; and iii) Manchester widespread pain at baseline, three-years and six-years in RRCs and controls.

To investigate self-reported pain trajectories for RRCs and controls we defined five widespread pain journeys for the six years covered by the study:

A. No widespread pain reported.

B. Persistent widespread pain.

C. Widespread pain resolving during the study.

D. Onset of widespread pain during the study.

E. Episodic widespread pain.

How the five pain trajectories are mapped to ACR-90 widespread pain reporting at baseline, three-years and six-years is shown in Table 9.2.

Table 9.2 Definitions of self-reported widespread pain trajectories in the six years from baseline.

		ACR-90 widespread pain reporting		
		Baseline	**3 years**	**6 years**
A.	No widespread pain reported	X	X	X
B.	Persistent widespread pain	✓	✓	✓
C.	Widespread pain improving	✓	X	X
		✓	✓	X
D.	Onset of widespread pain during study	X	✓	✓
		X	X	✓
E.	Episodic widespread pain	✓	X	✓
		X	✓	X

We investigated pain trajectories for RRCs and controls by calculating the percentage of RRCs and controls identified by each of the five pain trajectories.

9.4 Results

9.4.1 Analysis 1: Demographics, socioeconomic characteristics and illness perceptions at baseline

As in Chapter Seven, of the 8,286 responders to NorStOP baseline and three-year surveys consenting to medical record review with a minimum of five years of medical record data, 24% (n=1,979) of individuals were identified as single-region controls, and 22% (n=1,786) were identified as RRCs.

Baseline socio-demographics and illness perceptions for controls and RRCs and the results of statistical testing for differences between RRCs and controls are shown in Table 9.3.

RRCs were significantly older (mean difference=0.97 years, 95% CI 0.39, 1.55), with a higher BMI (mean difference=0.88, 95% CI: 0.59, 1.17), more deprived (mean difference=-656, 95% CI: -1,137, -174), more likely to be female (percentage difference: 12%, 95% CI: 9, 15), and less likely to be in paid employment (percentage difference: -9%, 95% CI: -12, -6) than controls.

RRCs were similar to controls on marital/cohabiting status (percentage difference in married/ cohabiting: 3%, 95% CI: 0, 6), social networks (percentage difference most isolated: 3%, 95% CI: -1, 6), and whether they lived alone (percentage difference: 3%, 95% CI: 1, 6). There were no significant differences between RRCs and controls in perceiving psychological problems as causes of ill-health (mean difference= 0.03 95% CI: -0.17, 0.22), or accident or chance as causes of ill-health (mean difference=0.02, 95% CI: -0.07, 0.10), nor on whether they considered risk factors (mean difference=-0.18, 95% CI: -0.38, 0.04) or immunity (mean difference=-0.05, 95% CI: -0.12, 0.08) as causes of ill-health.

Table 9.3 Comparison of RRCs and controls on demographics and self-reported social network index and illness perceptions.

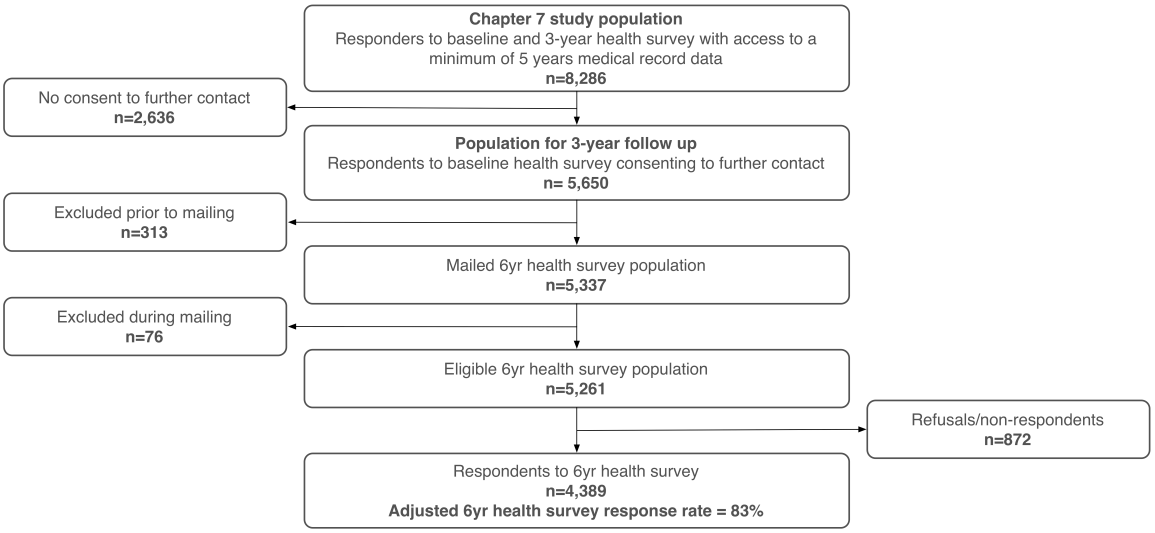
	Controls (n =1,979)	RRCs (n = 1,786)	Mean/percentage difference (95% CI)	p-value
Gender				**<0.001**
Female	959 (49%)	1,084 (61%)	12% (9, 15)	
Male	1,020 (52%)	702 (39%)		
Age, mean (sd)	64.0 (9.1)	65.0 (9.1)	0.97 (0.39,1.55)	**0.001**
Marital status*				0.58
Married or cohabiting	1,462 (75%)	1,268 (72%)	-3% (-6, 0)	
Not married or cohabiting	500 (25%)	499 (28%)		
Lives alone*				0.18
Yes	384 (20%)	399 (23%)	3% (1, 6)	
No	1,524 (80%)	1,309 (77%)		
Current employment status*				**<0.001**
Paid employment	672 (35%)	452 (26%)	-9% (-12, -6)	
Not in paid employment (unemployed, retired, ill health, housewife, other)	1,255 (65%)	1,265 (74%)		
Social class[a] *				**0.001****
High	420 (22%)	310 (19%)	-4% (-6, -1)	
Middle	398 (21%)	304 (18%)	-3% (-5, 0)	
Low	1,069 (57%)	1,043 (63%)	6% (3, 10)	
Deprivation score[b], mean (sd)*	14,044 (7,667)	13,953 (7,451)	-656 (-1,137, -175)	**0.008**
BMI, mean (sd)*	26.6 (4.3)	27.5 (4.7)	0.88 (0.59, 1.17)	**<0.001**
Berkman-Syme social network index[c]*				0.11
Most isolated (index I or II)	972 (60%)	939 (63%)	3% (-1, 6)	
Most integrated (index III or IV)	636 (40%)	545 (37%)		
Illness perception questionnaire, causal component[d]*				
Risk factor attribution score, mean (sd)	27.3 (3.1)	27.1 (3.3)	-0.18 (-0.38, 0.04)	0.102
Psychological attribution score, mean (sd)	23.1 (3.0)	23.1 (3.0)	0.03 (-0.17, 0.22)	0.778
Immunity attribution score, mean (sd)	12.2 (1.5)	12.2 (1.6)	-0.05 (-0.12, 0.08)	0.71
Accident/chance attribution score, mean (sd)	6.8 (1.3)	6.8 (1.3)	0.02 (-0.07, 0.10)	0.726

a. Higher = higher managerial, higher professional or lower managerial/professional. Middle = intermediate occupations or self-employed. Lower = lower supervisory/technical, semi-routine or routine occupations (Office for National Statistics 2005).
b. Rank index of multiple deprivation (Payne and Abel 2012) (low score = high deprivation)
c. Berkman-Syme social network index (Berkman and Syme, 1979)
d. Illness perception questionnaire (Moss-Morris et al. 2002) (high score = belief in specified attribute causing condition, Risk factor attribution 7-35; Psychological attribution 6-30; Immunity attribution 3-15; Accident/chance attribtion: 2-10).
sd. standard deviation
*Data on these variables were incomplete with n ranging from 1,608 to 1,962 for controls and 1,484 to 1,767 for RRCs.
**Calculated using logistic regression (low social class as reference category).
All self-reported health and pain measures from baseline health survey responses.
p-values in bold are less than or equal to 0.05.

9.4.2 Analysis 2: Changes in self-reported health and pain over time

Of the 8,286 responders to baseline and three-year surveys, 5,650 (68%) consented to follow-up (Figure 9.1). Of those consenting to follow-up, 389 (7%) were either excluded by GPs (for example patients with terminal illnesses or dementia) or during the mailing (deaths, departures, unwell, or returned addressee unknown). Of those eligible for follow-up, 83% (n = 4,389) responded to the six-year health survey and were therefore eligible for inclusion in this analysis. The same percentage (53%) of both RRCs (n=957), and controls (n=1,043) responding at baseline and three years (study population from Analysis One) also responded at six-year follow-up.

Figure 9.1 Participation flowchart for changes in health over time analysis.



a. Participation bias

The baseline demographics and self-reported health and pain of responders to baseline and three-year health surveys only (incomplete responders), and responders to baseline, three-year and six-year health surveys (study sample for Analysis Two) is shown in Table 9.4. Differences between responders to baseline and three years only, and responders to baseline, three years and six years were small for all variables tested.

However, while differences were small, the study sample (responders to baseline, three years and six years) were younger (mean difference=-2.64 years, 95% CI: 3.03, -2.25), less deprived (mean difference=-1,036, 95% CI: -1,357, -715), more likely to be married or cohabiting (percentage difference: 3%, 95% CI: 1, 4), and in paid employment (percentage difference: 6%, 95% CI: 4, 8),

of a high social class (percentage difference: 4, 95% CI: 2, 6), with better self-reported baseline physical health (SF-12 physical component score: mean difference=1.74, 95% CI: 1.18, 2.29; SF-36 physical function score: mean difference=5.09, 95% CI: 3.76, 6.41), less depression (mean difference on HADS depression scale=-0.38, 95% CI: -0.53, -0.23), and less cognitive impairment (mean difference=-1.15, 95% CI: -2.08, -0.22) than those not-responding to six-year follow-up.

Table 9.4 Comparison of baseline demographics and self-reported health and pain in responders to baseline and three years and responders to baseline, three years and six years.

	Incomplete responders (Responders to baseline and 3 years only) n = 3,897	**Study sample** (Responders to baseline, 3 years and 6 years) n = 4,389	**Mean/percentage difference (95% CI)**
Gender			
Female	2,068 (53%)	2,409 (55%)	2% (0, 4)
Male	1,829 (47%)	1,980 (45%)	
Age, mean (sd)	65.9 (9.6)	63.2 (8.5)	-2.64 (3.03, -2.25)
Marital status*			
Married or cohabiting	2,774 (72%)	3,233 (74%)	3% (1, 4)
Not married or cohabiting	1,089 (28%)	1,114 (26%)	
Current employment status*			
Paid employment	1,049 (28%)	1,464 (34%)	6% (4, 8)
Not in paid employment (unemployed, retired, ill health, housewife, other)	2,709 (72%)	2,813 (66%)	
Social class[a] *			
High	716 (20%)	985 (24%)	4% (2, 6)
Middle	682 (19%)	864 (21%)	2% (0, 4)
Low	2,217 (61%)	2,329 (56%)	-6% (-8, -3)
Deprivation score[b], mean (sd)*	14,502 (7,590)	13,466 (7,292)	-1,036 (-1,357, -715)
Self-reported health at baseline			
SF-12 physical component score (0-100)[c], mean (sd)*	41.5 (12.4)	43.3 (12.1)	1.74 (1.18, 2.29)
SF-12 mental component score (0-100)[c], mean (sd)*	49.9 (10.8)	50.4 (10.8)	0.43 (0.64, 0.92)
SF-36 physical function score (0-100)[d], mean (sd)*	63.3 (31.3)	68.4 (28.5)	5.09 (3.76, 6.41)
Anxiety (0-21)[e], mean (sd)*	6.4 (4.1)	6.5 (4.2)	0.09 (-0.09, 0.27)
Depression (0-21)[e], mean (sd)*	4.5 (3.5)	4.1 (3.4)	-0.38 (-0.53, -0.23)
Cognitive impairment (0-100)[f], mean (sd)*	13.0 (21.9)	11.8 (20.0)	-1.15 (-2.08, -0.22)
Baseline self-reported pain (%)*	2,806 (72%)	3,183 (73%)	1% (-1, 2)
Baseline ACR-90 widespread pain (%)*	853 (22%)	997 (23%)	1% (-1, 3)
Baseline Manchester widespread pain (%)*	516 (13%)	609 (14%)	1% (-1, 2)

a. Higher = higher managerial, higher professional or lower managerial/professional. Middle = intermediate occupations or self-employed. Lower = lower supervisory/technical, semi-routine or routine occupations (Office for National Statistics 2005).
b. Rank index of multiple deprivation (Payne and Abel 2012) (low score = high deprivation)
c. 12 item short form health survey – physical and mental component summary scores (Ware et al. 1996) (100 best health)
d. 36 item short form health survey – physical functioning subscale (Ware et al. 1992) (100 best health)
e. Hospital Anxiety and Depression Scale (Zigmond and Snaith 1983) (21 worst health)
f. Sickness Impact Profile – alertness subscale (Bergner et al. 1981) (100 worst health)
sd. standard deviation
*Data on these variables were incomplete with n ranging from 3,615 to 3,863 for baseline and three-year only responders and 4,178 to 4,347 for the study sample.
All self-reported health and pain measures from baseline health survey responses.

b. Changes in self-reported health

In the six years from baseline, for both RRCs and controls, self-reported health (SF-12 mental and physical component score, and SF-36 physical function score) declined, while there was an improvement in self-reported anxiety but little change in self-reported depression (HADS) (Table 9.5). The highest magnitude of change was observed in physical function score (SF-36), with mean reductions from baseline scores: at three years of 3.1 for RRCs, and 3.6 for controls; and at six years of 5.7 for RRCs, and 7.6 for controls. Changes in self-reported health over time for all other variables examined were small.

Controls had slightly higher levels of decline in self-reported physical health (SF-12 physical component and SF-36 physical function scores) than RRCs. However, the only significant mean difference between RRCs and controls was change between baseline and six-years on the SF-12 physical component score ($p=0.012$, mean difference=1.22, 95% CI 0.27, 2.18); although controls still had much better self-reported physical health at six years than RRCs. Changes in psychological measures (SF-12 mental component score, and HADS anxiety and depression) over time for RRCs and controls were similar (Table 9.6).

Table 9.5 Changes in mean self-reported health (sd) over time for RRCs and controls.

Outcome	Control n=1,043	RRC n=957	Mean difference between controls and RRCs (95% CI)	p-value**
SF-36 physical function score* (High score = best health)				
Baseline	75.3 (25.2)	55.3 (29.1)		
3 years	71.7 (27.0)	52.0 (29.8)		
6 years	67.8 (29.1)	49.2 (30.7)		
Mean difference between BL and 3-year scores	-3.6 (15.9)	-3.1 (19.1)	0.55 (-1.04, 2.14)	0.494
Mean difference between BL and 6-year scores	-7.6 (19.5)	-5.7 (21.3)	1.81 (-0.27, 3.65)	0.053
SF-12 physical component score* (High score = best health)				
Baseline	45.8 (11.2)	37.1 (11.6)		
3 years	44.8 (11.2)	36.8 (11.2)		
6 years	43.7 (11.6)	36.6 (11.5)		
Mean difference between BL and 3-year scores	-1.0 (8.5)	-0.5 (8.9)	0.47 (-0.37, 1.32)	0.271
Mean difference between BL and 6-year scores	-1.9 (9.5)	-0.7 (10.2)	1.22 (0.27, 2.18)	**0.012**
SF-12 mental component score* (High score = best health)				
Baseline	51.4 (10.3)	48.3 (11.7)		
3 years	50.9 (9.7)	47.7 (11.2)		
6 years	50.5 (9.8)	47.2 (10.9)		
Mean difference between BL and 3-year scores	-0.5 (9.5)	-0.9 (10.5)	-0.36 (-1.34, 0.61)	0.465
Mean difference between BL and 6-year scores	-1.0 (10.5)	-1.2 (11.3)	-0.25 (-1.29, 0.82)	0.663
HADs anxiety* (High score = worst health)				
Baseline	5.96 (3.95)	7.53 (4.12)		
3 years	5.39 (3.96)	6.86 (4.24)		
6 years	5.12 (3.86)	6.46 (4.24)		
Mean difference between BL and 3-year scores	-0.61 (2.88)	-0.71 (3.12)	-0.10 (-0.37, 0.17)	0.470
Mean difference between BL and 6-year scores	-0.90 (3.15)	-1.07 (3.43)	-0.17 (-0.47, 0.13)	0.259
HADs depression* (High score = worst health)				
Baseline	3.66 (3.12)	4.96 (3.42)		
3 years	3.59 (3.26)	4.89 (3.54)		
6 years	3.65 (3.34)	4.92 (3.63)		
Mean difference between BL and 3-year scores	-0.10 (2.39)	-0.08 (2.58)	0.01 (-0.21, 0.23)	0.917
Mean difference between BL and 6-year scores	-0.01 (2.69)	-0.04 (2.95)	-0.03 (-0.29, 0.22)	0.794

*Data on these variables were incomplete with n ranging from 899 to 1,034 for controls and 757 to 941 for RRCs.
**p-value for independent t-test testing for differences between control and RRC means.
BL: Baseline
p-values in bold are less than or equal to 0.05.

c. Changes in self-reported pain

Table 9.6 shows frequency of self-reported pain in RRCs and controls at baseline, three years, and six years. For controls prevalence of self-reported pain increased with time from baseline to six-year follow-up; prevalence of any pain rose from 33% to 70%, and ACR-90 widespread pain increased from 15% to 22%. For RRCs widespread pain prevalence increased from baseline to six years, with ACR-90 widespread pain prevalence 37% at baseline and 43% and 42% at three and six years respectively. Prevalence of any self-reported pain in RRCs was 90% both at baseline and three years, reducing to 86% at six years.

Self-reported pain was higher in RRCs than controls for all self-reported pain definitions at each time point. There was approximately twice as many RRCs than controls reporting ACR-90 widespread pain at each time point.

Table 9.6 Number (%) of cases and controls self-reporting pain at baseline, 3 years and 6 years.

	Control n=1,043			**RRC** n=957		
	Baseline	3 years	6 years	Baseline	3 years	6 years
Any self-reported pain	346 (33%)	730 (70%)	731 (70%)	858 (90%)	858 (90%)	825 (86%)
ACR-90 widespread pain	161 (15%)	218 (21%)	231 (22%)	355 (37%)	413 (43%)	404 (42%)
Manchester widespread pain	89 (9%)	137 (13%)	144 (14%)	224 (23%)	269 (28%)	273 (29%)

Table 9.7 shows self-reported ACR-90 widespread pain trajectories over the six years of the study for RRCs and controls. Only 37% (n=354) of RRCs, compared to 67% (n=695) of controls, did not report ACR-90 widespread pain on any of the three health surveys (baseline, three years or six years). Thirty-seven percent of RRCs either reported widespread pain on all three surveys (B. Persistent ACR-90 pain), or reported the onset of widespread pain at three or six years (D. Onset of ACR-90 pain during the study). Twenty-five percent either had widespread pain that resolved (C. ACR-90 pain improving) or episodic widespread pain (E).

Table 9.7 Self-reported widespread pain trajectories over six years.

	Control n=1,043	**RRC** n=957
A. No ACR-90 pain reported	695 (67%)	354 (37%)
B. Persistent ACR-90 pain	76 (7%)	186 (19%)
C. ACR-90 pain improving	67 (6%)	125 (13%)
D. Onset of ACR-90 pain during study	137 (13%)	174 (18%)
E. Episodic ACR-90 pain	68 (7%)	118 (12%)

9.5 Discussion

As shown previously across all ages, RRCs were older, and more likely to be female in this population aged 50 and over. We found that they also had an increased BMI, and a lower socioeconomic status (more deprived, less likely to be in paid employment and, a lower social class) than controls recorded as consulting for problems in a single musculoskeletal region (axial, lower limb or upper limb). However, differences between RRCs and controls were small, and there was no significant difference between RRCs and controls on marital/cohabiting status, social isolation, living alone, or perceptions regarding the causes of illness.

In the six years from baseline there was little change in self-reported health status for both RRCs and controls. Mean self-reported physical health declined slightly, depression was stable, while self-reported anxiety improved slightly. The largest changes were seen in self-reported physical function (SF-36) with a mean fall between baseline and six-year scores of -5.7 for RRCs, and -7.6 for controls.

Prevalence of self-reported widespread pain in RRCs showed a five to six percent increase between baseline and three years; whereas between three years and six years, there was a one percent increase in ACR-90 widespread pain and a one percent decrease in Manchester widespread pain. Single-region controls demonstrated a lower prevalence of self-reported pain than RRCs, but demonstrated increased pain reporting over time.

Thirty-seven percent of RRCs had either persistent widespread pain or onset of widespread pain during the study compared to 20% of controls.

9.5.1 Demographics, socioeconomic characteristics and illness perceptions

In the following interpretation of the baseline differences between RRCS and controls we must keep in mind the caveat that differences were small for the majority of variables assessed.

RRCs were older and more likely to be female than single-site musculoskeletal consulters, consistent with findings from the systematic review reported in Chapter Three – where we noted increased prevalence of CWP in women and older people.

We found that RRCs lived in more deprived areas, were more likely to be in a low social class, and less likely to be in paid employment than controls – this is consistent with the findings from the British Birth Cohort (Macfarlane et al. 2009a), a 2009 study (Davies et al. 2009a) demonstrating that low socioeconomic status is related to new onset of CWP, and a Brazilian study (Assumpçao et al. 2009) suggesting higher CWP prevalence in a low socioeconomic population. However, RRCs were slightly older than controls, so retirement may account for fewer RRCs being in paid employment than controls, but age differences were small, so these findings appear to support the theory that the RRC definition identifies patients from the CWP/FM spectrum.

Increased rates of divorce have been seen in FM patients (Wolfe et al. 1995), CWP has been shown to be associated with insecure attachment styles (Davies et al. 2009b), and more pain sites have been noted in individuals who are separated or divorced (Kamaleri et al. 2008b). Conversely, in this study marital status was similar in RRCs and controls, and in a group of over 50s, it is likely that mortality rather than divorce is the reason for being single.

A 2002 (Bergman et al.) study suggested that personal social support reduced the risk of CWP onset, suggesting that our finding of more social isolation than integration in RRCs is consistent with the RRC definition identifying individuals with CWP. However, we found similar levels of social isolation in controls, suggesting that increased social isolation is not specific to RRCs.

Research has shown that, compared to those with acute pain, patients with chronic pain have higher scores for all four causal attributions on the illness perceptions questionnaire (Moss-Morris et al. 2002) and a recent study (Cedraschi et al. 2013) suggested that 50% of patients with FM attributed their condition to psychological problems. In accord with this we found a moderate to high score for belief in psychological causes of disease in RRCs (mean score: 23, sd 3, range of

possible scores: 6–30), however, the other three causal attributions on the illness perceptions questionnaire also scored towards the higher end of score ranges, and RRCs and controls had similar perceptions regarding the causes of ill-health. Being aware of, and addressing patients beliefs regarding the possible cause for their condition may help in tailoring treatment, and helping patients understand the onset of their condition and manage their future behaviour.

Our finding of an increased BMI in RRCs is consistent with findings in CWP patients from the 1958 British Birth Cohort (Van Den Kerkhof et al. 2011) and consequently, since it might be a risk factor, diet and lifestyle advice should be considered when managing these patients.

9.5.2 Changes in self-reported health and pain over time

RRCs showed little deterioration in their generally already poor self-reported health, suggesting that this is a group who have already reached a level of chronic ill-health. This is consistent with research (Walitt et al. 2011) demonstrating little change in self-reported pain and health over time for FM patients. However, there was a moderate decline in physical function suggesting a continuing deterioration albeit at a similar rate to controls. SF-36 physical function score has been shown to be correlated to a FM symptom scale based on the widespread pain index and symptom severity score from the ACR-2010 criteria (Wolfe et al. 2011a). The lower SF-36 physical function score in RRCs than controls is therefore consistent with RRCs fitting the construct for CWP. This, and the moderate decline in physical function over time, underline the importance of identifying this group early and attempting to intervene before they progress to a more severe state. However, the older age group analysed by this study may also account for limited changes in health over time and the small differences observed between RRCs and controls.

Changes in self-reported mental health for RRCs over the six years of the study were small and somewhat conflicting. SF-12 mental component score deteriorated slightly over the duration of the study, but anxiety scores improved, and depression scores remained stable. The limited changes again suggest a group who have already reached a poor level of health, however, slight improvements in anxiety might reflect an adaptation to chronic pain (von Korff and Simon 1996), but it would be imprudent to draw conclusions from such small changes.

Over 60% of RRCs reported ACR-90 widespread pain on one or more of the three questionnaires administered over the six years of the study. Since RRCs are defined by primary care consultation

patterns favoring repeat consulters this is consistent with previous research (McBeth et al. 2001a) suggesting that frequent primary care attendance for symptoms disrupting daily living is a risk factor for persistent CWP.

The increase in widespread pain prevalence and deterioration in physical function in RRCs between baseline and three years might represent increasing pain and disability in RRCs over time, or may be as a result of the timeframe used to define RRCs in this study. RRCs were identified using five years of medical record data starting two years before the baseline health survey. Therefore, since RRCs are identified by a minimum of three years of health record data, at baseline some RRCs may not yet be symptomatic, but by three years all RRCs will, by definition, have had multisite symptoms sufficient to seek primary care advice, thereby making it more probable that the RRCs we identified for this study will report widespread pain at three years than at baseline. Evidence from the pain trajectories of RRCs might support the theory that increases in prevalence between baseline and three years were as a result of new onset of symptoms. Eighteen percent of RRCs reported onset of CWP at either three or six years. However, 13% of controls also reported new onset of widespread pain during the six year study period. Future work could elucidate the relationship between time of RRC 'diagnosis' (i.e. point at which RRC criteria fulfilled) and onset of self-reported widespread pain symptoms. This is important as, if RRC criteria are met before patients fulfil strict self-reported CWP criteria, this could be a useful early recognition mechanism with the possibility for intervening to modify risk factors and thereby reducing the progression to a more severe and persistent form of CWP (McBeth et al. 2001a).

The plateauing of self-reported widespread pain prevalence figures between three and six years also suggests the increased prevalence seen between baseline and three years is partly a result of the timeframe used to identify RRCs. We can postulate that the initial increase in prevalence at three years is at least partially due to the RRCs who fulfilled criteria after baseline, and then the levelling of prevalence between three and six years could be due to either a static picture, where patients have settled into stable pain patterns, or a more dynamic situation with equal numbers of relapsing and remitting RRCs. The second, more dynamic situation, is supported by the observation that 18% of the RRCs had onset of widespread pain during the study, and 25% had self-reported widespread pain that either resolved during the six years of the study or was episodic. Further, this is consistent with previous research (Croft et al. 1993, Hunt et al. 1999,

McBeth et al. 2001a, Aggarwal et al. 2006) demonstrating a stable prevalence of CWP over time and the resolution of symptoms in half of CWP cases within a year (McBeth et al. 2001a).

Of note in the control group, is the large increase from 33% to 70% in self-reported pain between baseline and three-years. This is likely to be partially due to the timeframe over which controls were identified. Controls were individuals recorded as consulting for only one of the three body regions specified in the RRC criteria (axial, upper limb or lower limb) over the five years starting two years prior to the baseline health questionnaire. Consequently some controls might not have had symptoms at baseline, but developed their symptoms and consulted for them in the three years following the baseline questionnaire.

9.5.3 Strengths and limitations

a. Study population

As previously discussed in Chapter Seven (section 7.5.3.a) the two study samples used in this chapter are taken from a cohort of people aged 50 years and over which may limit whether we can apply our findings to the general population.

In Chapter Seven (section 7.5.3.a) we demonstrated that any differences between the sample for Analysis One and either non-responders or incomplete responders were small and unlikely to affect the generalisability of findings.

We used a subsample to investigate changes in self-reported health and pain over time (Analysis Two) who responded to six-year follow-up questionnaire. We tested for participation bias by investigating the differences between responders to baseline and three-year follow-up only (incomplete responders), and those who also responded to six-year follow-up (the study sample). The study sample were younger, more likely to be female, more likely to be married or cohabiting, less deprived, more likely to be in paid employment and in a high social class, with better self-reported physical health, less depression, less cognitive impairment, worse self-reported mental health, more anxiety, and more likely to report baseline pain. However, the generally small mean and percentage differences suggest that they are unlikely to affect the generalisability of the findings.

While differences between study samples and non- or partial-responders were small for all variables assessed, findings must be treated with caution as, for both analyses, less than a third of the eligible population (i.e. all those invited to take part in the baseline study) were included.

b. Changes in self-reported health over time

Defining changes in self-reported health over time by calculating the differences between three isolated assessments of self-reported health over a period of six years will miss fluctuating health between those measurements. The measures we used to assess changes in self-reported health over time will therefore miss some of the nuances of an individual's changing health status, however taken together they offer us means of establishing trends in self-reported health of the sample.

c. Changes in pain over time

Prevalence figures for self-reported widespread pain are likely to be influenced by the five-year period in which RRCs are identified. As discussed above (section 9.5.2) for this study RRCs were identified using the five years of medical record data starting two years before baseline health questionnaire, which means that prevalence at three years is likely to be higher than baseline prevalence because not all RRCs identified were likely to be symptomatic at the time of the baseline questionnaire.

Defining pain trajectories based on pain reporting at baseline, three-year and six-year health questionnaires is also problematic. Extrapolating a continuous pain experience from information given at three isolated time points is unlikely to represent the true course of pain. In addition, the episodic pain trajectory is perhaps a little misleading since it may represent either an individual with an isolated and now resolved episode of widespread pain, or someone with more relapsing and remitting pattern. It therefore has the potential to include both those with a new episode and those with a resolved episode of widespread pain. Our figures for onset and improving widespread pain trajectories might therefore be underestimates. However, despite their limitations, the pain trajectories used do provide us with a crude assessment of how an individual's pain might change over time.

d. Control group

We used a group of patients recorded as consulting for musculoskeletal problems in a single region (axial, upper limb or lower limb) in the five years starting two years before baseline health questionnaire as a control group. Since single-region pain is a risk factor for progression to CWP (Gupta et al. 2007) it is perhaps not surprising that our single-region control group showed more deterioration in self-reported health and similar levels of change in widespread pain reporting than the RRCs under investigation. In addition, differences between RRCs and single-region consulters are likely to be less than those between RRCs and those who do not consult for musculoskeletal conditions.

An alternative would have been to use a group of non-musculoskeletal consulters as a comparison. However, this approach would have made it impossible to determine whether any differences observed were due to being a RRC or simply consulting for a musculoskeletal

problem. Using a group of single-region musculoskeletal consulters as a control group meant that differences in changes in health and pain over time between cases and controls were small, but we did observe higher levels of anxiety and depression, worse self-reported physical health, and lower socio economic status in RRCs. In addition the slightly higher deterioration in the control group served to highlight the relatively small changes in self-reported health of our RRCs. The control group are a group of musculoskeletal consulters who did not develop as RRCs and there are some baseline differences (e.g. worse self-reported health and lower socioeconomic status) between controls and RRCs which may indicate factors related to a greater risk of moving from single-region to multi-region pain.

9.6 Conclusions

RRCs have been shown to be older and more likely to be female, with low socioeconomic status, and increased BMIs, findings that are consistent with previous research into CWP. In addition, over 60% of RRCs reported ACR-90 widespread pain on one or more of the health questionnaires between baseline and six years. This suggests that RRC criteria are effectively identifying individuals from the CWP/FM spectrum.

RRCs have poor self-reported health and report little deterioration in health over time suggesting that this is a group with already poor health; highlighting the importance (discussed in Chapter Eight) of identifying RRCs early. Evaluation of changes in pain reporting over time supports previous research suggesting that CWP prevalence remains constant over time with equal numbers of relapsing and remitting CWP cases.

Chapter 10
Discussion

10.1 Introduction

This thesis aimed to develop an approach to identifying primary care consulters with chronic widespread pain (CWP) from their medical records using the existing consultation-based definition of CWP developed by Jens Rohrbeck as a starting point. The characteristics of the recurrent consulters for regional musculoskeletal complaints identified by the modified definition were then described. This chapter presents a discussion of the main findings of this thesis, the contribution of this project to the existing knowledge in the field, the implications of the work for future research and clinical practice, and a critical reflection on its strengths and limitations.

10.2 Summary of findings

There is a group of patients who regularly consult for multiple regional pain complaints (RRCs) who may not be recognised by their GPs as having a generalised pain condition. The new approach to identifying RRCs (using all regional musculoskeletal Read codes rather than the original limited code list developed by Rohrbeck et al. 2007) increased the number of patients identified and returned a similar group of patients with features consistent with patients self-reporting CWP. However, not all RRCs self-reported CWP and fulfilling the RRC criteria was associated with worse consultation-based health (more consultations, more frequent attendance) than self-reported CWP status, but self-reported CWP status was associated with worse self-reported health than RRC status alone. This suggests that RRCs are frequent consulters who share features with CWP patients, but include those perhaps less severely affected and therefore do not necessarily fit established and strict CWP criteria, but are likely to sit towards the end of a spectrum of polysymptomatic distress.

Key findings from the thesis are presented in Table 10.1.

Table 10.1 Key findings from the thesis.

Findings relevant to chronic widespread pain conditions
Prevalence • The general population prevalence of FM is 1–2% and CWP is 10–11% • The annual recorded prevalence of non-specific generalised pain conditions likely to be related to CWP in primary care is 0.1–2.3%. • Annual primary care recorded prevalence of Read codes with the potential to record CWP (e.g. fibromyalgia, fibrositis) is substantially lower than community CWP prevalence estimates, suggesting that CWP is under-diagnosed or under-recognised in primary care. • Five-year prevalence for RRCs is 442 to 1,149 per 10,000 depending on code list used to define RRCs. • Five-year prevalence using the final code list (RRC-all) and codes likely to represent CWP combined is 1,432/10,000. This is higher than community prevalence of CWP (1,077/10,000) and that predicted by estimated consultation prevalence of CWP (775/10,000). *Code lists* • It is possible to use a list of all regional musculoskeletal Read codes with existing Rohrbeck-2007 RRC criteria to identify patients resembling those identified using the original restricted code list. Using all regional codes identifies more RRCs, but the extra RRCs identified still fit the RRC profile • RRCs identified using a list of all regional musculoskeletal Read codes were more likely to be recorded as consulting for a problem in only one limb (plus axial problem), and have an injury code recorded than RRCs identified using the original Rohrbeck short code list. *Overlap of RRCs with non-specific generalised pain coding* • Three-quarters of RRCs are not recorded with a non-specific generalised pain code and are therefore potentially unrecognised as having a generalised pain condition. • A third of patients recorded with a non-specific generalised pain code were identified by the RRC-all definition. Non-specific pain consulters not identified as RRCs had lower consultation demands. • RRCs also recorded with a non-specific generalised pain codes had worse consultation-based health than those RRCs who were not. *Association with self-reported CWP* • The RRC-all definition identified over a third of patients self-reporting persistent widespread pain however, up to 89% of RRCs did not report persistent widespread pain. • Fulfilling RRC criteria was associated with worse consultation-based health than self-reported CWP status, but self-reported CWP status was associated with worse self-reported health than RRC status. This suggests RRCs are frequent consulters who share features with CWP patients, but include those less severely affected and who therefore do not necessarily fit established and strict CWP criteria, but are likely to sit towards the end of a spectrum of polysymptomatic distress. *Time to identify RRCs* • It is possible to identify RRCs up to two years earlier than the five-year period specified in the RRC definition. Those identified earlier have more severe consultation-based health. • It is possible to remove the separate-years criterion and therefore capture RRCs as soon as they have been recorded with four separate regional musculoskeletal consultations, one axial consultation, and one for an upper or lower limb complaint. Removing the separate-years criterion identifies more RRCs, but the extra RRCs are possibly less likely to fit the RRC profile.

Findings relevant to chronic widespread pain conditions

Characteristics of RRCs

- RRCs are more likely to be female, older, more deprived, not in paid employment, and with higher BMIs than controls recorded as consulting for single-region musculoskeletal problems.
- RRCs have worse consultation-based health than controls recorded as consulting for single-region musculoskeletal problems, with more frequent attendance, higher rates of primary care consultation, and more recorded somatic symptoms.
- RRCs have more sleep problems, worse self-reported mental and physical health than controls recorded as consulting for single-region musculoskeletal problems.
- RRCs show little change in self-reported health and pain over time.

Severity Scale

- RRCs are more severely affected if: i) they are recorded as consulting for problems in all three body regions (axial, upper- and lower-limb) defined in the RRC criteria; ii) they are identified earlier; iii) they are also recorded with a non-specific generalised pain code; and iv) they fulfil the requirement as in the original definition for regional musculoskeletal consultations in each of three separate years.
- There is potential to develop a severity scale for RRCs using number of body regions consulted for, time to identification, concomitant recording of non-specific generalised pain codes, and requirement for regional consultations in each of three separate years.

Methodological findings

- Patterns of consultation for specific morbidity codes can be used in primary care data to identify a well defined patient group.
- When aiming to identify a specified patient group from Read-coded data, the group identified can be validated by: i) comparing coding prevalence with prevalence figures predicted by existing literature; and ii) matching the profile (for example, age/gender distribution, measures of health status) of the patients identified to those of the clinical phenotype intending to be identified.

10.3 Discussion of findings

10.3.1 Under-recognition of CWP in primary care

a. Community, consulting and coding prevalence of CWP

Research (Faulconer and de Lusignan 2004) has recommended comparing expected community prevalence of a condition with its recorded prevalence as an indicator of diagnostic data quality (in primary care). However, in this case, rather than assessing coding quality, we were attempting to investigate whether the RRC definition (our diagnostic test) was successfully identifying individuals with CWP. In a sense we were testing how well our measures of 'recognised CWP' (non-specific generalised pain coding), and 'unrecognised CWP' (RRC criteria), identified CWP consulters. Even so, since research (Macfarlane et al. 1999) suggests 28% of CWP will not consult for their pain, we would not expect community and consulting prevalence figures to be equal.

There is a distinction to be made between the actual community prevalence of a condition, the prevalence of patients who consult their GP for that condition, and the prevalence of patients recorded as having the condition. Not all patients with a specific problem will consult their GP for it consequently, consultation prevalences will be lower than community population prevalence estimates. Additionally, for chronic conditions, a diagnostic label for a repeatedly consulted complaint may only be coded once, for example at the time of diagnosis (Jordan et al. 2004). Consequently, when calculating prevalence using dated event-based data, there is potential for a patient to be missed if the diagnostic label was assigned during a consultation event that occurred before or after the period for which consultation prevalence is assessed.

Coding prevalence will offer some measure of consulting prevalence but will also reflect the coding practices and diagnostic beliefs of the clinician (Jordan et al. 2007). Prevalence based on morbidity coding relies on what is recorded by clinicians during a consultation. Problems in primary care frequently do not conform to the biomedical framework of coding classification models, CWP being a good example. As described in section 2.3.1 in instances of clinical uncertainty, the diagnostic and recording practices of an individual clinician are likely to play a role in the codes they assign to the patient's problem, particularly if, like CWP/FM, the diagnosis is a controversial one.

We found the primary care coding prevalence of FM to be considerably lower than predicted by community prevalence, even accounting for a proportion of patients not consulting for their symptoms. This is consistent with findings from two large database studies (Gallagher et al. 2004, Hughes et al. 2006) that found FM coding to be considerably lower than general population figures would predict.

We found that codes for conditions related to CWP (for example fibromyalgia, muscular rheumatism) were under-recorded in primary care when compared to what we might expect from general population prevalence figures and also given that research suggests that CWP is associated with 'a pattern of illness behaviour characterised by frequent visits to a medical practitioner' (McBeth 2001b, p.95). The under-recording of CWP in primary care is consistent with what we might expect, given: the contention surrounding FM and CWP as valid diagnoses (section 2.2.3); the evidence suggesting that coding is not a neutral activity (section 2.3.2); evidence that many musculoskeletal complaints are not coded (Salisbury et al. 2013); and evidence that completeness of coding of conditions with subjective case definitions is variable (Jordan et al. 2004).

b. Recognised and unrecognised CWP consulting prevalence

It was hoped that Rohrbeck's (2002) theory that CWP patients were being recorded with multiple consultations for regional pain (for example, elbow pain, knee pain) would account for the missing CWP consulters (the observed disparity between community prevalence of CWP and recorded prevalence of conditions related to CWP). We hypothesised that RRCs represented unrecognised CWP in primary care, and individuals with a recorded generalised condition related to CWP (non-specific generalised pain codes) represented recognised CWP. By investigating the overlap between recognised and unrecognised CWP we hoped to be able to estimate the amount of CWP in primary care. However, the combined prevalence of RRCs and individuals coded with non-specific pain complaints was higher than general population estimates for CWP prevalence. While this suggests that all those fulfilling the RRC criteria might not meet strict CWP criteria, this finding is consistent with evidence suggesting FM/CWP exists at the extreme end of a spectrum of polysymptomatic distress (Häuser et al. 2009c, Wolfe et al. 2013) with the excess RRC prevalence a result of inclusion of less severe cases.

10.3.2 Association of RRCs with CWP

In discussing the association between RRCs and self-reported CWP we will consider two themes: a) the evidence that RRCs share features with self-reported CWP; and b) the association between RRC status and self-reported CWP status.

a. Evidence for RRCs sharing features with self-reported CWP

Throughout this thesis we have accumulated observations suggesting that RRCs share features with those self-reporting CWP. For ease of reference, these are collated and considered below.

We have demonstrated that recurrent regional consulting is associated with: i) female gender and increasing age; ii) frequent attendance; iii) comorbidity (including increased recording of generalised pain conditions and CWP and FM differential diagnoses); iv) increased numbers of recorded somatic symptoms, self-reported sleep problems and cognitive impairment; v) poor self-reported health; vi) little change in pain and health status over time; and vii) poor socioeconomic status. Whilst none of these on their own are conclusive evidence that people fulfilling the RRC criteria have CWP, these are all features consistent with a diagnosis of CWP.

The age and gender distribution of RRCs was consistent with that of CWP in the general population observed in the systematic review (section 3.4.5.c and d). In addition, RRCs were shown to have high rates of consultation (for musculoskeletal and non-musculoskeletal problems) and to be more likely to be frequent attenders, which is consistent with research linking frequent attendance to both CWP (McBeth et al. 2001b, Kadam et al. 2005, Gupta et al. 2007) and medically unexplained syndromes (Smits et al. 2009, Reid et al. 2001b). However, it may also be a feature of the self-fulfilling nature of a definition that requires repeated consultation, although we excluded musculoskeletal conditions from our definition of frequent attendance. Further, although a third of RRCs were frequent attenders, the profile of RRCs was not the same as that of all frequent attenders.

RRCs were shown to have higher levels of comorbidity, compared to a group of controls recorded as consulting for single-site musculoskeletal problems. This is consistent with research suggesting an association between CWP and long-term increased mortality, particularly as a result of cancer (Macfarlane et al. 2001, McBeth et al. 2009), although other studies have not found such an association (Andersson 2009, Macfarlane et al. 2007).

Research suggests that CWP/FM can coexist with its differentials such as rheumatoid arthritis (Wolfe et al. 2009), Sjögren's syndrome (Ostuni et al. 2002), systemic lupus erythematosus (Middleton et al. 1994), and hypothyroidism (Bazzichi et al. 2007). Research has even postulated thyroid autoimmunity as a predisposition for FM (Bazzichi et al. 2012). Therefore, our finding of increased coding of rheumatoid arthritis, systematic lupus erythematosus, Sjögren's syndrome, and hypothyroidism in RRCs is consistent with a diagnosis of CWP.

RRCs had more recorded somatic symptoms, self-reported sleep problems, and cognitive impairment than single-region controls. Many studies have shown an association between somatic symptoms and CWP/FM (McBeth et al. 2001a and 2001b, Aggarwal et al. 2006, Häuser et al. 2009c, Wolfe et al. 2013). Somatic symptoms are now a part of the ACR-2010 definition for FM, and fatigue, waking unrefreshed, and cognitive symptoms are the three somatic symptoms individually scored in the definition (Wolfe et al. 2010), suggesting that RRCs share important features with CWP/FM patients.

Research has shown FM and CWP to be associated with poor self-reported mental and physical health (Walitt et al. 2011, Wolfe et al. 2013), and little change in self-reported pain and health over time (Walitt et al. 2011). This is consistent with our findings for RRCs.

We showed that recurrent regional consulting was linked to low socioeconomic status. RRCs were more likely to be in a low social class than controls, more deprived, and less likely to be in paid employment (however, RRCs were identified from a cohort of over 50s, who were therefore more likely to be retired). This is consistent with other studies of CWP (Macfarlane et al. 2009a, Assumpção et al. 2009, Wolfe et al. 2013).

Clearly, RRCs share many characteristics with CWP. Taken together, the features of RRCs offer a persuasive argument that they fit the profile for CWP. However, as we have already discussed (section 10.3.1.b), RRCs and non-specific generalised pain coding over-estimate CWP, suggesting that not all RRCs would fulfil strict criteria for CWP.

b. Association between RRC and CWP status

We found that half of RRCs did not self-report CWP at either of the two survey points three years apart and only a third of those self-reporting persistent widespread pain fulfilled the RRC definition (37%). In addition, fulfilling RRC criteria was associated with worse consultation-based health than self-reporting CWP, but CWP status was associated with worse self-reported health than RRC status. This suggests that RRCs are frequent consulters who share features with CWP patients, but include those less severely affected and therefore do not necessarily fit established and strict CWP criteria. Considered together with the observation that there are more RRCs than community prevalence would predict, this again suggests that RRC criteria are capturing a group of consulters some of whom may not be affected enough to reach the diagnostic threshold for CWP, but still fit within the spectrum of CWP and polysymptomatic distress suggested by research, with FM at the extreme end (Häuser et al. 2009c, Wolfe et al. 2013).

Rather than identifying all CWP patients who consult their GP, as originally intended by the criteria, the RRC definition identifies a specific group of patients who are perhaps unrecognised as having a generalised condition, and therefore, through their consultation behaviour, are expressing a need that is likely to be unmet. This group is consequently an important one, since identifying them and managing them appropriately has the potential to improve their health (using interventions presented in section 2.2.6) and reduce consultation demands.

10.3.3 Identifying RRCs: developing the RRC definition

We tested a number of aspects of Rorhbeck's original definition. Specifically, we investigated three variables in the definition: i) the list of Read-codes; ii) the number of body regions they are required to be recorded as consulting for (axial, and upper and/or lower limb); and iii) the timeframe required for identification (three to five years, and number of separate years in which they must have a recorded musculoskeletal consultation).

a. Code lists

By investigating the profile of RRCs returned by three separate code lists (Rohrbeck original short code list, all regional musculoskeletal codes, and excluding from the list of all regional codes those felt by clinicians to be unlikely to represent CWP) we have shown the code list can be

expanded. This is important because the original short code list was developed in only one GP practice. Research (Gray et al. 2003) suggests that, even for a well defined disease like diabetes, there is a wide range of codes in use across different general practices. This suggests that it would be unlikely for the limited list of codes identified by Rohrbeck (2002) to be the same ones used in other practices, and implies that a broad range of codes needs to be used to identify a specific phenotype using routinely recorded data from multiple practices.

The three code lists generally returned similar groups of RRCs. However, the list of all regional musculoskeletal codes identified 60% more patients than Rohrbeck's original list of codes, and twice as many self-reported CWP patients. These findings and the diversity of coding approaches in use across different clinicians and different practices is a good argument for accepting the RRC-all list over the other two code lists. However, a comparison of the three groups of RRCs showed that the RRC-all group had more injuries coded, and lower proportions of patients consulting in all three body regions (axial, upper and lower limb) compared to the other two RRC groups.

b. Body regions

When we compared single-region controls with RRCs recorded as consulting in either two body regions (axial + upper or lower limb) or all three body regions (axial + upper and lower limb), we found an increasing severity (increased number of somatic symptoms, more consultations and more identified as frequent attenders) when moving from controls, through two-region RRCs, to three-region RRCs. With more two-region consulters in the RRC-all group, the gradation of severity from two- to three-region consulters suggests that the RRC-Rohrbeck and RRC-clinician groups are identifying a more severe group of RRCs who might be more likely to fit established ACR-90 CWP criteria. The RRC-all group might identify more of those who sit towards the less severe end. However, injury has been shown to be a risk factor for CWP (Buskila et al. 1997a) and research has shown a progression from single region to multisite pain (Kamaleri et al. 2008a), suggesting that fewer sites of pain should be considered a matter of gradation of severity. Some of those fulfilling RRC-all criteria may be on a pathway towards the more severe end of the spectrum, further longitudinal research would be needed to test this hypothesis.

We can conclude that given diversity in coding practice, the increased numbers of RRCs identified who still fit the expected RRC profile by the RRC-all definition, and the higher percentage of CWP patients identified by the RRC-all definition, the list of all regional codes should be used with the RRC definition and there is no argument for increasing number of body regions required by the definition to from two to three.

c. Timeframe

We were able to show that RRCs can be identified prospectively within three years of an index musculoskeletal consultation by investigating the profile of RRCs returned: i) in timeframes shorter than the five years required by the original criteria, and ii) by removing the requirement for musculoskeletal consultations in each of three separate years.

Nearly half of RRCs could be identified within three years of an index musculoskeletal consultation and those identified earlier were more severely affected. In clinical practice, this allows identification of severely affected individuals more promptly.

However, whilst removing the requirement for regional musculoskeletal consultations in each of three separate years resulted in earlier identification of RRCs, it identified extra individuals who no longer fit the RRC profile (lower consultation rates, fewer somatic symptoms). This implies that removing the requirement for consultations in each of three separate years would not be appropriate for identifying RRCs for research purposes, but that if the criteria were to be used prospectively in a clinical setting, then, if the separate years requirement were removed, clinicians should review patients on a case-by-case basis to determine whether they fit the CWP profile clinically.

We can conclude that for the RRC definition to be used prospectively for clinical practice it should be revised to identify individuals between three and five years from an index regional musculoskeletal consultation. For research purposes, involving retrospective identification of RRCs, the previous RRC definition with all regional musculoskeletal codes will suffice, although to identify the most severe RRC cases the timeframe could be reduced to three years.

d. The new RRC definition for clinical practice

Our definition of RRCs to be used in clinical practice therefore only changes two dimensions of the existing definition: the code list, and a requirement for prospective identification between three and five years from an index musculoskeletal consultation rather than a retrospective review of five years of consultation data. Our new RRC definition is shown in Table 10.2.

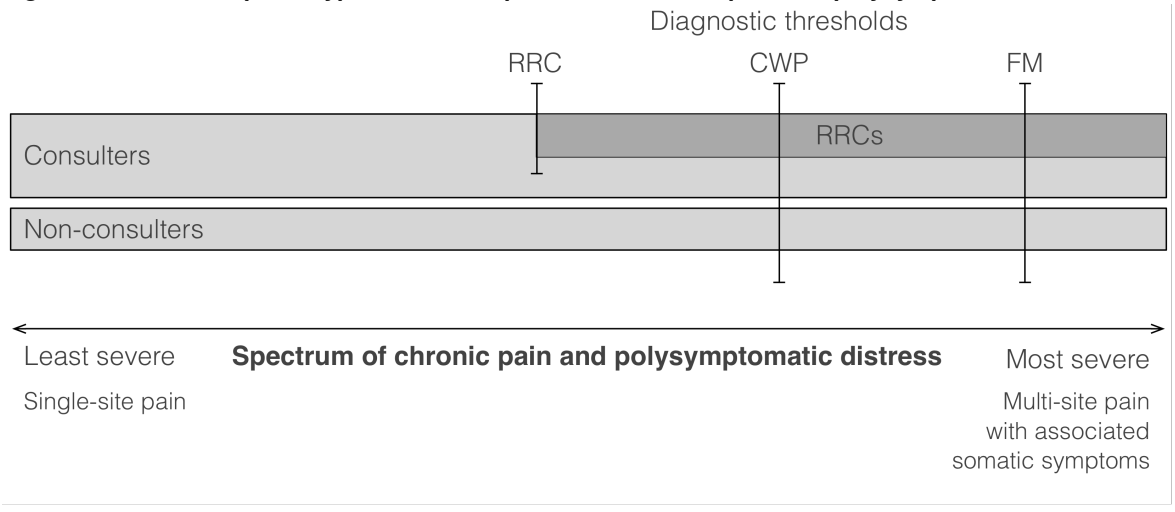
Table 10.2 New RRC definition for clinical practice.

Using a list of all regional musculoskeletal read codes. In a period from between 3 and 5 years following an index regional musculoskeletal consultation fulfil all of i)–iv): i) At least 1 consultation for a musculoskeletal complaint in the axial skeleton (neck & back); ii) At least 1 consultation for an upper or lower limb complaint; iii) At least 1 consultation for a regional musculoskeletal complaint in each of 3 separate years; iv) At least 4 consultations for regional musculoskeletal complaints in total.

10.3.4 The RRC phenotype

We have suggested that RRCs represent a subgroup of consulters with chronic pain as the prevailing symptom of their polysymptomatic distress who are often not recognised as having a more generalised pain condition associated with somatic symptoms. RRCs might not necessarily fit strict ACR-90 CWP criteria where there is a clear cutoff for diagnosis, but they are likely to fit on the scale of polysymptomatic distress presented in the ACR-2010 criteria (see Figure 10.1). The RRC definition therefore identifies a heterogeneous group of frequent consulters with predominantly musculoskeletal symptoms, including those less severely affected who do not therefore necessarily fit established and strict CWP criteria but nonetheless still exist at the less severe end of the spectrum of polysymptomatic distress characteristic of CWP and FM.

Figure 10.1 The RRC phenotype within the spectrum of chronic pain and polysymptomatic distress



10.4 Implications

10.4.1 Clinical practice

The new RRC definition suggested for clinical practice in Table 10.2 allows the use of routinely recorded data to identify a group of patients with potentially unmet needs. Many feel that due to the range of symptoms experienced and a multidisciplinary approach to treatment, CWP and FM should be managed in primary care (Endresen 2007, Shir and Fitzcharles 2009a, Glennon 2010, Ghazan-Shahi et al. 2012). This group of 'unrecognised' CWP patients is therefore important to identify in this setting. Their symptoms have reached a level where they are asking for help, and those symptoms are unlikely to be managed appropriately if they are treated for the specific isolated regional pain complaints with which they are being coded. Further, RRCs have high consultation demands which may be reduced by appropriate interventions. However, since the RRC criteria identify a group including those less severely affected, rather than advocating that all RRCs need immediate specific treatment, the definition might be used as a tool to identify high-risk patients who would benefit from monitoring and potentially intervening before they progress towards the more extreme end of the spectrum.

The utility of the RRC definition might be about highlighting the existence a group of high-risk patients with unmet needs rather than as a case identification tool. Given an under-recognition of CWP in primary care – suggested both by disparity between community and coding prevalences, and by the evidence that RRCs represent unrecognised CWP consulters (section 10.3.2), along with the controversy regarding the validity of CWP/FM (section 2.2.3) – it possible that even if a specific morbidity code for CWP existed, it would not be used. Therefore, before we can argue that there should be a Read code for CWP, there needs to be an improved awareness of FM/CWP in primary care. This suggests a need for specific training in identifying, coding, and managing these conditions for GPs. This is consistent with reports from doctors of inadequate formal training (Buskila et al. 1997b, Arshad and Ooi 2007, Kamoun et al. 2010) and difficulty in diagnosing FM (Perrot et al. 2012), and research suggesting limited awareness of diagnostic criteria (Buskila et al. 1997b, Blotman et al. 2005, Kamoun et al. 2010, Perrot et al. 2012).

Until there is an improved awareness of CWP/FM in primary care (potentially prompting a need for a specific morbidity code for CWP), the RRC definition could serve as a useful electronic flag (that is, a built-in software prompt alerting clinicians when a patient fulfils the definition) in primary care software for identifying individuals at risk to their doctors. GPs could then decide clinically whether a specific patient might benefit being more closely monitored or from an intervention aimed at CWP/FM. An electronic flag may also be useful as a tool to identify patients at risk of progressing to the more severe end of the CWP/FM spectrum in situations where reduced continuity of care hinders a clinician's ability to perceive a history of repeated musculoskeletal consultations as evidence of a more generalised condition.

10.4.2 Research implications

Some of the methods used in this study have important implications for other research using primary care consultation data. In developing and applying the RRC definition we have been able to demonstrate that it is possible to use consultation patterns for specific morbidity codes in primary care data to identify a unique group of consulters who share features with a clearly defined clinical group. By using consultation patterns to identify patients with high consultation demands, we demonstrated the potential for identifying clinically meaningful groups of frequent consulters who can be preferentially targeted in an attempt to help reduce consultation rates.

We have also shown that when aiming to identify a specified clinical phenotype from Read-coded data, the group identified can be validated using: i) prevalence figures predicted by existing literature; and ii) matching the profile (for example age/gender distribution, measures of health status) of the patients identified to those of the clinical phenotype intending to be identified.

There has been much criticism levelled at the ACR-90 criteria due to the circular logic used to arrive at the definition (Cohen 1999, Quintner and Cohen 1999). The RRC definition, while originally intended to identify ACR-90 CWP, is identifying a group defined by their consultation patterns rather than 'a circular argument in which the evidence on which the construct is based is taken as proof of its veracity' (Cohen and Quintner 1993, p.906). Using routinely recorded data, rather than a clinical trial or expert consensus, we have identified a group of individuals who appear to sit within a spectrum of polysymptomatic distress (section 10.3.2) and demonstrate differing gradations of severity related, for example, to the number of body regions recorded.

Using real-world data relying on help seeking behaviour we have therefore offered evidence to support the ACR-2010 severity scale definition of FM (Wolfe et al. 2010, 2011). In finding individuals who do not necessarily fulfil strict ACR-90 criteria, who have a less severe symptom profile, but still share many characteristics with self-reported CWP patients (ACR-90), the RRC definition offers weight to the argument that the ACR-90 criteria implemented an arbitrarily defined cut-off that failed to recognise a spectrum of pain and distress (Schochat et al. 1994, Croft et al. 1996, Wolfe 2003).

The RRC definition offers a pragmatic way of identifying a clinically meaningful group of individuals for future research. Identifying effective interventions for this group has the potential not only to improve patient health but also to reduce consultation demands.

10.5 Future work

Future work with the RRC definition has two broad strands: i) continued development of the RRC definition; and ii) application of the definition to identify a group of individuals for continued investigation.

10.5.1 Developing the RRC definition

There are a number of avenues open both for the continued development of the RRC definition and as a means of identifying all CWP consulters: i) developing a severity scale using variables in the existing criteria; ii) using the framework of the ACR-2010 widespread pain index and somatic symptom severity score to develop an alternate RRC definition incorporating a severity scale; iii) incorporation of non-Read coded data; iv) identifying all CWP consulters; and v) further validation of the existing definition.

a. Severity scale

During development of the RRC definition we have identified a number of variables linked to severity that could offer scope for developing a severity scale for RRCs: i) the number of body regions consulted for; ii) the time taken to fulfil RRC criteria; iii) the recording of non-specific generalised pain codes; and iv) the requirement for regional musculoskeletal consultations in each of three separate years.

In addition, our development of the RRC definition did not address the requirement for four regional musculoskeletal consultations. Research suggests an increasing number of pain sites is related to reduction in overall health, poor sleep quality, psychological distress (Kamaleri et al. 2008b), and number of reported somatic symptoms (Coggon et al. 2013). This suggests that varying the number of regional musculoskeletal consultations has the potential to offer another marker of RRC severity.

The heterogeneity of the RRC phenotype and identification of common subgroups of RRC could be assessed further by using cluster or latent class analysis to group patients fulfilling the RRC criteria based on characteristics such as: number of recorded somatic symptoms, number of recorded body regions, number of musculoskeletal and non-musculoskeletal consultations, and time to fulfilment of RRC criteria.

b. Developing an expanded RRC definition incorporating somatic symptoms

The ACR-2010 criteria use a combination of the number of the affected pain sites (widespread pain index) and a measure of the number of somatic symptoms (somatic symptom severity) experienced (Wolfe et al. 2010) to calculate an overall polysymptomatic distress score (Wolfe et al. 2011 and 2013). The RRC criteria could be redeveloped using a count of the number of body sites recorded (similar to the ACR-2010 widespread pain index), and a count of the number of somatic symptoms recorded (similar to the ACR-2010 somatic symptom severity score). In much the same way as the ACR-2010 polysymptomatic distress score, the new RRC definition (based on number of pain sites and number of somatic symptoms) would result in a score, rather than the individuals needing to fulfil a set of criteria, and therefore needing to meet a diagnostic threshold. This has the potential to offer a means of identifying CWP consulters who might be recorded with somatic symptoms (e.g. fatigue) rather than regional musculoskeletal complaints, and who may be more affected by somatic problems.

The RRC definition is based on Read-coded data only, therefore, the definition could be developed by incorporating prescribing data or information from free-text entries.

While there are no prescriptions that are used exclusively for FM/CWP, pharmacological interventions are used for chronic pain and FM, including tramadol, antidepressants, tropistetron, pramipexole, and pregabalin (Carville et al. 2008). Prescriptions for drugs like these, as well as existing RRC criteria, might serve as useful markers for CWP.

Research (Salisbury et al. 2013) suggests only 32% of musculoskeletal complaints are Read-coded, while 85% are recorded in free-text notes. This suggests that more RRCs may be 'hidden' in the free-text of the consultation. Natural language processing could be used to access information contained in the free text that may not be coded (Pakhomov et al. 2007). However, natural language processing may not yet be able to reliably extract nuanced medical meaning from free-text (Anandarajah et al. 2005).

c. Further validation

The RRC definition could be tested further by investigating the association between RRC status and the ACR-2010 polysymptomatic distress score (Wolfe et al. 2013). This would require a study linking medical records with individual patient assessment using the distress score.

Prior to incorporation of the RRC definition in primary care software, the clinical relevance of the definition needs to be assessed by qualitative exploration with clinicians. Discussion with clinicians could be used to assess whether RRC status is a clinically useful concept: whether identifying a patient as a RRC would prompt further assessment of the patient with possible intervention (using managements aimed at CWP), or, given the controversy around the FM/CWP diagnosis, the prompt would be ignored. If the RRC criteria are clinically acceptable to GPs, given the possibility for a severity scale, it would be useful to discuss what diagnostic threshold doctors feel it clinically meaningful to be alerted to a patient's RRC status.

10.5.2 Applying the RRC definition

The RRC definition could be used to identify a clinically relevant group of high users of primary care for continued research. The effectiveness of specific interventions for RRCs could be tested by conducting a clinical trial (for example, to test cognitive behavioural therapy in RRCs).

Since we found little deterioration in self-reported health for RRCs over six years, it may be that this is a group who do not deteriorate further. Perhaps the reason they are not coded with generalised pain conditions is because they have a stable level of poor health and the GP is reluctant to offer a label that might be counterproductive to coping (Ehrlich 2003a). Our study did not investigate the timing of non-specific generalised pain coding in relation to the point at which RRCs fulfil the RRC criteria. It would therefore be helpful to investigate whether initially 'unrecognised' RRCs, are 'recognised' over time, by investigating the timing of both generalised pain coding and secondary care referral patterns. It would also be useful to investigate the relationship between fulfilling RRC criteria and self-reporting CWP, to assess whether the RRC criteria identify patients before they meet strict CWP criteria. If they do, this would offer a means of investigating whether implementing interventions in an at-risk population (i.e. before patients progress to a more severe form of polysymptomatic distress) reduces their risk of their condition deteriorating. Longitudinal data could be used to assess whether there are specific risk factors for recurrent regional consulting, thereby offering a rationale for attempting to modify specific risk factors in an at-risk population.

10.6 Strengths and limitations

10.6.1 Validation of RRC criteria

In attempting to validate the RRC criteria we used three approaches: i) comparing coding prevalence with prevalence figures predicted by existing literature; ii) matching the consultation profile of RRCs to that expected from patients with self-reported CWP; and iii) matching the demographic, socioeconomic, self-reported health and pain status of RRCs to that of CWP patients.

We have already discussed how differences between community, consulting, and coding prevalence for a controversial condition like CWP makes such comparisons problematic (section 2.2.1.a). Additionally, we were comparing point estimates for community prevalence with five-year estimates for CWP coding prevalence (RRC and non-specific pain coding combined). However, we were able to derive some useful information about the recognition of CWP in primary care from these data.

There is a circular logic to defining a group of individuals based on their consultation pattern and then validating that definition using consultation patterns. However, we attempted to mitigate this problem by defining frequent attendance based on *non*-musculoskeletal consultations (the RRC definition was based on repeated *musculoskeletal* consultations) and we were able to demonstrate that self-reported CWP patients had a similar pattern of non-musculoskeletal frequent attendance, somatic symptom recording, and consultation rates.

The main problem we had in validating the RRC criteria was that we were attempting to define a phenotype that has previously not been identified; that is, a group of recurrent consulters in primary care, with a prevailing symptom of chronic musculoskeletal pain, who are potentially unrecognised by their GPs as having a generalised condition associated with somatic symptoms. We therefore had no reference standard against which to compare the RRCs identified by our criteria. However, the RRC phenotype is closely related to FM/CWP, and these conditions have been studied extensively using the ACR-90 definition. We were able to demonstrate that RRCs share many characteristics with CWP, and taken together, the features of RRCs offer a persuasive argument that they fit the profile for CWP (see section 10.3.2).

10.6.2 CWP versus recurrent regional consulting

The RRC definition does not identify all CWP patients, and it does not even identify all CWP consulters. However, the definition does identify an important group of patients with potentially unmet needs and high consultation demands.

10.6.3 Data

The study used two datasets: The Consultations in Primary Care Archive (CiPCA) and the North Staffordshire Osteoarthritis Project (NorStOP).

a. CiPCA

The CiPCA dataset contains anonymised primary care consultation data from up to 13 (depending on year) general practices in the North Staffordshire area of the UK. Although North Staffordshire is generally quite deprived in comparison to the average for England, these practices cover both more affluent and more deprived areas. The practices involved are part of the Keele GP Research Partnership, consequently, routine clinical data recorded by the practices are regularly audited by the informatics team from the Primary Care and Health Sciences Research Institute at Keele University (Porcheret et al. 2004). The data quality has been demonstrated to be similar to that of larger national primary care consultation databases giving comparable musculoskeletal consultation prevalences to national UK and international databases (Jordan et al. 2007, 2013). At least one morbidity code is required to be entered for each contact to the practice.

Generalisability may be reduced by the geographical limitation of the CiPCA study to one area of the UK (North Staffordshire). The CiPCA population is older than the UK general population (Table 4.1) and it is likely that other features may also be systematically different. However, differences in the age and gender distribution of the study population were accounted for by standardising prevalence figures to the UK general population. European geographical variation in CWP prevalence has been demonstrated to be limited (section 3.4.5.b), so limiting the study geographically may only have a small influence on generalisability.

b. NorStOP

The North Staffordshire Osteoarthritis Project (NorStOP), is a prospective epidemiological study of pain and general health in community-dwelling adults aged 50 years and over (Thomas et al. 2004b). Using an older population is likely to limit the generalisability of the findings from Chapters Seven and Nine. While we were able to demonstrate minimal differences between RRCs from all age groups, and the subgroup aged 45 and over on number of recorded somatic symptoms (section 5.4.4) and number of musculoskeletal consultations (5.4.3.a), we must be cautious about extrapolating our findings to all age groups.

Less than a third of the eligible population (i.e. all those invited to take part in the baseline study) were included in analyses using NorStOP data, and we cannot therefore exclude the risk of participation bias. However, differences between study samples, and non- or partial-responders were demonstrated to be small on all variables assessed (sections 7.4.1.a and 9.4.2.a).

10.6.4 Read codes

a. Musculoskeletal

By including most musculoskeletal Read codes, the RRC-all definition is unlikely to miss RRCs, as it accounts for diversity in coding practices. However, not all the codes represent musculoskeletal pain (for example, N0967: unstable ankle), and the list includes codes for conditions that clinicians on the advisory panel felt were inappropriate for use in CWP, such as structural derangements (e.g. meniscal tears, haemarthrosis, and fracture), infections, and inflammatory arthropathies. However, the consultation pattern required for RRCs appears to have successfully filtered out individuals not sharing features with CWP.

There may be codes with the potential to represent musculoskeletal problems outside the Read code chapters we used that should have been included on the list of all regional musculoskeletal codes – such as mastalgia, which is included in Chapter K (genitourinary system diseases), and codes from Chapter 2 (codes relating to clinical examination findings) representing musculoskeletal pain on examination, for example, Rohrbeck's original code list included one code (2H23: on examination painful arc) from Read code Chapter 2.

b. Somatic symptoms

The new ACR-2010 criteria emphasise the importance of somatic symptoms in identifying CWP/FM patients. By identifying patients consulting for regional musculoskeletal complaints only, the criteria may not be identifying all 'unrecognised' CWP since it is not picking up consultations with these patients that are coded only with somatic symptoms, such as, fatigue and difficulty concentrating. However, being recorded with a somatic symptom might imply that the patient has actually been recognised as having a functional somatic syndrome, and the intention of the RRC definition was to identify CWP patients who were hiding behind multiple single-region presentations in primary care.

10.6.5 Non Read-coded primary care data

In using only Read-coded data, the RRC definition may be missing some unrecognised CWP consulters. Research (Salisbury et al. 2013) suggests only 32% of musculoskeletal complaints are Read-coded, while 85% are recorded in free-text notes, suggesting, as noted earlier, that evidence of widespread pain and somatic symptoms may be 'hidden' in the free-text of the consultation.

10.7 Conclusions

The new approach to identifying RRCs, using all regional musculoskeletal Read codes and identifying patients prospectively after a minimum of three to a maximum of five years from an index musculoskeletal consultation, identifies more patients earlier, and returns a similar group of patients with features consistent with patients self-reporting CWP. However, RRC prevalence overestimates CWP prevalence and not all RRCs self-report CWP. This suggests that the RRC criteria identify a heterogenous group of frequent consulters who generally share features with CWP patients, include those less severely affected and therefore do not necessarily fit established and strict CWP criteria. They nonetheless still exist on the spectrum of polysymptomatic distress characteristic of CWP and FM. RRCs therefore represent a subgroup of consulters, with chronic pain as the prevailing symptom of their polysymptomatic distress, who are often not recognised as having a more generalised pain condition associated with somatic symptoms.

There an under-recognition of CWP in primary care, implying a need for specific training for GPs on this condition. The RRC definition could be used clinically as an electronic flag in primary care software to identify individuals who might benefit from being more closely monitored or from an intervention aimed at CWP/FM, or as a research tool to identify a clinically important group of chronic pain consulters. Whilst there appear to be effective treatments for patients with widespread pain, we do not yet understand how best to help those recurrently consulting with regional musculoskeletal problems.

References

Aaron, L.A., Burke, M.M., Buchwald, D., 2000. Overlapping conditions among patients with chronic fatigue syndrome, fibromyalgia, and temporomandibular disorder. Archives of Internal Medicine, 160(2), 221–227.

Ablin, J.N., Cohen, H., Clauw, D.J., Shalev, R., Ablin, E., Neumann, L., Sarzi-Puttini, P., Buskila, D., 2010a. A tale of two cities – the effect of low intensity conflict on prevalence and characteristics of musculoskeletal pain and somatic symptoms associated with chronic stress. Clinical and Experimental Rheumatology, 28(6, S63), S15–21.

Ablin, J.N., Cohen, H., Eisinger, M., Buskila, D., 2010b. Holocaust survivors: the pain behind the agony. Increased prevalence of fibromyalgia among Holocaust survivors. Clinical and Experimental Rheumatology, 28(6, S63), S51–6.

Ablin, J.N., Oren, A., Cohen, S., Aloush, V., Buskila, D., Elkayam, O., Wollman, Y., Berman, M., 2012. Prevalence of fibromyalgia in the Israeli population: a population-based study to estimate the prevalence of fibromyalgia in the Israeli population using the London Fibromyalgia Epidemiology Study Screening Questionnaire (LFESSQ). Clinical and Experimental Rheumatology 30 (Supplement 74), 39–43.

Abusdal, U.G., Bjorndal, A., Botten, G., Bjerkedal, T., 1997a. Muscle pain in women between 25 and 55 years in Oslo, Norway. Journal of Musculoskeletal Pain, 5(3), 23–31.

Abusdal, U.G., Hagen, K.B., Bjorndal, A., 1997b. Self-reported chronic muscle pain among women in Oslo. Tidsskrift for den Norske Laegeforening, 117(11), 1606–1610.

Adamson, G., Murphy, S., Shevlin, M., Buckle, P., Stubbs, D., 2007. Profiling schoolchildren in pain and associated demographic and behavioural factors: A latent class approach. Pain, 129(3), 295–303.

Aggarwal, V.R., Mcbeth, J., Zakrzewska, J.M., Lunt, M., Macfarlane, G.J., 2006. The epidemiology of chronic syndromes that are frequently unexplained: do they have common associated factors? International Journal of Epidemiology, 35(2), 468–476.

Ahmad, A.-W., Dag, E., Kurt, S., 2004. The influence of sociodemographic characteristics on health care utilisation in a Swedish municipality. Upsala Journal of Medical Sciences, 109(1), 33–42.

Album, D., Westin, S., 2008. Do diseases have a prestige hierarchy? A survey among physicians and medical students. Social Science and Medicine, 66(1), 182–188.

Aloush, V., Ablin, J.N., Reitblat, T., Caspi, D., Elkayam, O., 2007. Fibromyalgia in women with ankylosing spondylitis. Rheumatology International, 27(9), 865–868.

Altman, D.G., Machin, D., Bryant, T.N., Gardner, M.J., 2000. Statistics with confidence. 2nd edition. London: BMJ Books.

Alvarez-Nemegyei, J., Gutierrez, B.L.N., Sanchez, J.A.A., 2005. Rheumatic diseases and labor disability in adult rural population. Revista Medica del Instituto Mexicano del Seguro Social, 43(4), 287–292.

Alvarez-Nemegyei, J., Pelaez-Ballestas, I., Sanin, L.H., Cardiel, M.H., Ramirez-Angulo, A., Goycochea-Robles, M.V., 2011. Prevalence of musculoskeletal pain and rheumatic diseases in the southeastern region of Mexico. A COPCORD-based community survey. The Journal of Rheumatology, 38(S86), 21–25.

Anandarajah, S., Tai, T., de Lusignan, S., Stevens, P., O'Donoghue, D., Walker, M., Hilton, S., 2005. The validity of searching routinely collected general practice computer data to identify patients with chronic kidney disease (CKD): a manual review of 500 medical records. Nephrology, Dialysis, Transplantation, 20(10), 2089–2096.

Andersson, H.I., 1994. The epidemiology of chronic pain in a Swedish rural area. Quality of Life Research, 3(S1), S19–26.

Andersson, H., Ejlertsson, G., Leden, I., 1998. Widespread musculoskeletal chronic pain associated with smoking. An epidemiological study in a general rural population. Scandinavian Journal of Rheumatology, 30(3), 185–191.

Andersson, H.I., Ejlertsson, G., Leden, I., Scherstén, B., 1999. Musculoskeletal chronic pain in general practice. Studies of health care utilisation in comparison with pain prevalence. Scandinavian Journal of Primary Health Care 17(2), 87–92.

Andersson, H.I., 2009. Increased mortality among individuals with chronic widespread pain relates to lifestyle factors: a prospective population-based study. Disability and Rehabilitation, 31(24), 1980–1987.

Andrianakos, A., Trontzas, P., Christoyannis, F., Dantis, P., Voudouris, C., Georgountzos, A., Kaziolas, G., Vafiadou, E., Pantelidou, K., Karamitsos, D., Kontelis, L., Krachtis, P., Nikolia, Z., Kaskani, E., Tavaniotou, E., Antoniades, C., Karanikolas, G., Kontoyanni, A., ESORDIG Study, 2003. Prevalence of rheumatic diseases in Greece: a cross-sectional population based epidemiological study. The ESORDIG Study. The Journal of Rheumatology, 30(7), 1589–1601.

Annemans, L., Wessely, S., Spaepen, E., Caekelbergh, K., Caubère, J. P., Lay, K. L., Taïeb, C., 2008. Health economic consequences related to the diagnosis of fibromyalgia syndrome. Arthritis and Rheumatism, 58(3), 895–902.

Arshad, A., Ooi, K.K., 2007. Awareness and perceptions of fibromyalgia syndrome: A survey of Southeast Asian rheumatologists. Journal of Clinical Rheumatology, 13(2), 59–62.

Assumpção, A., Cavalcante, A.B., Capela, C.E., Sauer, J.F., Chalot, S.D., Pereira, C.A.B., Marques, A.P., 2009. Prevalence of fibromyalgia in a low socioeconomic status population. BMC Musculoskeletal Disorders, 10, 64.

Atherton, K., Berry, D.J., Parsons, T., Macfarlane, G.J., Power, C., Hyppönen, E., 2009. Vitamin D and chronic widespread pain in a white middle-aged British population: evidence from a cross-sectional population survey. Annals of Rheumatic Disease, 68(6), 817–822.

Bannwarth, B., Blotman, F., Roué-Le Lay, K., Caubère, J.-P., André, E., Taïeb, C., 2009. Fibromyalgia syndrome in the general population of France: a prevalence study. Joint Bone Spine, 76(2), 184–187.

Barrett, D.H., Gray, G.C., Doebbelling, B.N. Claw, D.J., Reeves, W.C., 2002. Prevalence of symptoms and symptom-based conditions among Gulf War veterans: current status of research findings. Epidemiologic Reviews, 24(2), 218–227.

Bayly, J., 2005. IT and osteoporosis–the GP's perspective. Osteoporosis Review, 13(3), 15–18.

Bazelmans, E., Vercoulen, J.H., Galama, J.M., Van Weel, C., der Meer, van, J.W., Bleijenberg, G., 1997. Prevalence of chronic fatigue syndrome and primary fibromyalgia syndrome in The Netherlands. Nederlands Tijdschrift voor Geneeskunde, 141(31), 1520–1523.

Bazelmans, E., Vercoulen, J.H., Swanink, C.M., Fennis, J.F., Galama, J.M., Van Weel, C., der Meer, van, J.W., Bleijenberg, G., 1999. Chronic Fatigue Syndrome and Primary Fibromyalgia Syndrome as recognized by GPs. Family Practice, 16(6), 602–604.

Bazzichi, L., Rossi, A., Giuliano, T., De Feo, F., Giacomelli, C., Consensi, A., Ciapparelli, A., Consoli, G., Dell'Osso, L., Bombardieri, S., 2007. Association between thyroid autoimmunity and fibromyalgic disease severity. Clinical Rheumatology 26(12), 2115–2120.

Bazzichi, L., Rossi, A., Zirafa, C., Monzani, F., Tognini, S., Dardano, A., Santini, F., Tonacchera, M., De Servi, M., Giacomelli, C., De Feo, F., Doveri, M., Massimetti, G., Bombardieri, S., 2012. Thyroid autoimmunity may represent a predisposition for the development of fibromyalgia? Rheumatology International, 32(2), 335–341.

Beard, G.M., 1894. A practical treatise on nervous exhaustion (neurasthenia): Its symptoms, nature, sequences, treatment. 3rd edition. New York: E. B. Treat.

Bedson, J., McCarney, R., Croft, P., 2004. Labelling chronic illness in primary care: a good or a bad thing? The British Journal of General Practice, 54(509), 932–938.

Benjamin, S., Morris, S., McBeth, J., Macfarlane, G.J., Silman, A.J., 2000. The association between chronic widespread pain and mental disorder: a population-based study. Arthritis and Rheumatism, 43(3), 561–567.

Benson, T., 2002. Why general practitioners use computers and hospital doctors do not—Part 2: scalability. British Medical Journal, 325(7372), 1090–1093.

Bergman, S., 2005. Psychosocial aspects of chronic widespread pain and fibromyalgia. Disability and Rehabilitation, 27(12), 675–683.

Bergman, S., Herrström, P., Högström, K., Petersson, I.F., Svensson, B., Jacobsson, L.T., 2001. Chronic musculoskeletal pain, prevalence rates, and sociodemographic associations in a Swedish population study. The Journal of Rheumatology, 28(6), 1369–1377.

Bergman, S., Herrström, P., Jacobsson, L.T., Petersson, I.F., 2002. Chronic widespread pain: a three year followup of pain distribution and risk factors. The Journal of Rheumatology, 29(4), 818–825.

Bergner, M., Bobbitt, R.A., Carter, W.B., Gilson, B.S., 1981. The Sickness Impact Profile: development and final revision of a health status measure. Medical Care, 19(8), 787–805.

Berkman, L.F., Syme, S.L., 1979. Social networks, host resistance, and mortality: a nine-year follow-up study of Alameda County residents. American Journal of Epidemiology, 109(2), 186–204.

Blanco, I., de Serres, F., Janciauskiene, S., Arbesu, D., Fernandez-Bustillo, E., Carcaba, V., Nita, I., Astudillo, A., 2007. Estimates of the prevalence and number of fibromyalgia syndrome patients and their alpha-1 antitrypsin phenotypic distribution in ten countries. Journal of Musculoskeletal Pain, 15(4), 9–23.

Block, S.R., 1999. On the nature of rheumatism. Arthritis Care and Research, 12(2),129–138.

Blotman, F., Thomas, E., Myon, E., Andre, E., Caubere, J. P., Taïeb, C., 2005. Awareness and knowledge of fibromyalgia among French rheumatologists and general practitioners. Clinical and Experimental Rheumatology, 23(5), 697–700.

Blyth, F.M., March, L.M., Brnabic, A.J., Jorm, L.R., Williamson, M., Cousins, M.J., 2001. Chronic pain in Australia: a prevalence study. Pain, 89(2–3), 127–134.

Bowers, S., Cannizzaro, K., Gregus, J., Scott, Q., Eason, J., 2009. Outcomes in cardiopulmonary physical therapy: sickness impact profile. Cardiopulmonary Physical Therapy Journal, 20(1), 19–24.

Bowling A., 1997. Research methods in health. Buckingham: Open University Press.

Branco, J.C., Bannwarth, B., Failde, I., Abello Carbonell, J., Blotman, F., Spaeth, M., Saraiva, F., Nacci, F., Thomas, E., Caubère, J.-P., Le Lay, K., Taieb, C., Matucci-Cerinic, M., 2010. Prevalence of fibromyalgia: a survey in five European countries. Seminars in Arthritis and Rheumatism, 39(6), 448–453.

Burkholder-Krommes, J.F., 2002. Soft Tissue Rheumatism. Hospital Physician, Rheumatology Board Review Manual, 6(3), 1, 2–6.

Buskila, D., Press, J., Gedalia, A., Klein, M., Neumann, L., Boehm, R., Sukenik, S., 1993. Assessment of nonarticular tenderness and prevalence of fibromyalgia in children. The Journal of Rheumatology, 20(2), 368–370.

Buskila, D., Neumann, L., Vaisberg, G., Alkalay, D., Wolfe, F., 1997a. Increased rates of fibromyalgia following cervical spine injury. A Controlled study of 161 cases of traumatic injury. Arthritis and Rheumatism, 40(3), 446–452.

Buskila, D., Neumann, L., Sibirski, D., Shvartzman, P., 1997b. Awareness of diagnostic and clinical features of fibromyalgia among family physicians. Family Practice, 14(3), 238–241.

Buskila, D., Abramov, G., Biton, A., Neumann, L., 2000. The prevalence of pain complaints in a general population in Israel and its implications for utilization of health services. The Journal of Rheumatology, 27(6), 1521–1525.

Buskila, D., Ablin, J.N., Ben-Zion, I., Muntanu, D., Shalev, A., Sarzi-Puttini, P., Cohen, H., 2009. A painful train of events: increased prevalence of fibromyalgia in survivors of a major train crash. Clinical and Experimental Rheumatology, 27(5, S56), S79–85.

Cakirbay, H., Cebi, A., Cebi, E., Karkucak, M., Capkin, E., 2006. Risk factors of fibromyalgia in Turkish women. Pain Clinic, 18(3), 251–257.

Cardiel, M.H., Rojas-Serrano, J., 2002. Community based study to estimate prevalence, burden of illness and help seeking behavior in rheumatic diseases in Mexico City. A COPCORD study. Clinical and Experimental Rheumatology, 20(5), 617–624.

Carmona, L., Ballina, J., Gabriel, R., Laffon, A., EPISER Study Group, 2001. The burden of musculoskeletal diseases in the general population of Spain: results from a national survey. Annals of the Rheumatic Diseases, 60(11), 1040–1045.

Carnes, D., Parsons, S., Ashby, D., Breen, A., Foster, N.E., Pincus, T., Vogel, S., Underwood, M., 2007. Chronic musculoskeletal pain rarely presents in a single body site: results from a UK population study. Rheumatology, 46(7), 1168–1170.

Carville, S.F., Arendt-Nielsen, S., Bliddal, H., Blotman, F., Branco, J.C., Buskila, D., Da Silva, J.A.P., Danneskiold-Samsøe, B., Dincer, F., Henriksson, C., Henriksson, K.G., Kosek, E., Longley, K., McCarthy, G.M., Perror, S., Puszczewicz, M., Sarzi-Puttini, P., Silman, A., Späth, M., Choy, E.H., 2008. EULAR evidence-based recommendations for the management of fibromyalgia syndrome. Annals of the Rheumatic Diseases, 67(4), 536–541.

Cavalcante, A.B., Sauer, J.F., Chalot, S.D., Assumpcao, A., Lage, L.V., Matsutani, L.A., Marques, A.P., 2006. The prevalence of fibromyalgia: A literature review. Revista Brasileira de Reumatologia, 46(1), 40–48.

Cedraschi, C., Girard, E., Luthy, C., Kossovsky, M., Desmeules, J., Allaz, A.-F., 2013. Primary attributions in women suffering fibromyalgia emphasize the perception of a disruptive onset for a long-lasting pain problem. Journal of Psychosomatic Research, 74(3), 265–269.

Chaaya, M., Slim, Z.N., Habib, R.R., Arayssi, T., Dana, R., Hamdan, O., Assi, M., Issa, Z., Uthman, I., 2012. High burden of rheumatic diseases in Lebanon: a COPCORD study. International Journal of Rheumatic Diseases, 15(2), 136–143.

Chaiamnuay, P., Darmawan, J., Muirden, K.D., Assawatanabodee, P., 1998. Epidemiology of rheumatic disease in rural Thailand: a WHO-ILAR COPCORD study. Community Oriented Programme for the Control of Rheumatic Disease. The Journal of Rheumatology, 25(7), 1382–1387.

Chen, J.J.H., Guo, M.S., You, Y.W., Liaw, L.J., Kuo, H.W., 2008. Factors affecting fibromyalgia in Nantou County. Mid-Taiwan Journal of Medicine, 13(3), 136–142.

Cho, N.H., Kim, I., Lim, S.H., Kim, H.A., 2012. Prevalence of widespread pain and its influence on quality of life: population study in Korea. Journal of Korean Medical Science, 27(1), 16–21.

Choudhury, Y., Bremner, S.A., Ali, A., Eldridge, S., Griffiths, C.J., Hussain, I., Parsons, S., Rahman, A., Underwood, M., 2013. Prevalence and impact of chronic widespread pain in the Bangladeshi and White populations of Tower Hamlets, East London. Clinical Rheumatology, 32(9), 1375–1382.

Cimmino, M.A., Zampogna, A., Murroni, S., Baruffi, S., Alessio, G., Maio, T., Mela, G.S., 2002. Methodology of an epidemiologic prevalence study in rheumatology: the Chiavari study. Reumatismo, 54(1), 40–47.

Cimmino, M.A., Ferrone, C., Cutolo, M., 2011. Epidemiology of chronic musculoskeletal pain. Best Practice and Research Clinical Rheumatology, 25(2), 173–183.

Clark, J.D., 2002. Chronic pain prevalence and analgesic prescribing in a general medical population. Journal of Pain and Symptom Management, 23(2), 131–137.

Clark, P., Burgos-Vargas, R., Medina-Palma, C., Lavielle, P., Marina, F.F., 1998. Prevalence of fibromyalgia in children: a clinical study of Mexican children. The Journal of Rheumatology, 25(10), 2009–2014.

Clauw, D.J., Crofford, L.J., 2003. Chronic widespread pain and fibromyalgia: what we know, and what we need to know. Best Practice and Research Clinical Rheumatology, 17(4), 685–701.

Coggon, D., Ntani, G., Palmer, K.T., Felli, V.E., Harari, R., Barrero, L.H., Felknor, S.A., Gimeno, D., Cattrell, A., Vargas-Prada, S., Bonzini, M., Solidaki, E., Merisalu, E., Habib, R.R., Sadeghian, F., Masood Kadir, M., Warnakulasuriya, S.S.P., Matsudaira, K., Nyantumbu, B., Sim, M.R., Harcombe, H., Cox, K., Marziale, M.H., Sarquis, L.M., Harari, F., Freire, R., Harari, N., Monroy, M.V., Quintana, L.A., Rojas, M., Salazar Vega, E.J., Harris, E.C., Serra, C., Martinez, J.M., Delclos, G., Benavides, F.G., Carugno, M., Ferrario, M.M., Pesatori, A.C., Chatzi, L., Bitsios, P., Kogevinas, M., Oha, K., Sirk, T., Sadeghian, A., Peiris-John, R.J., Sathiakumar, N., Wickremasinghe, A.R., Yoshimura, N., Kelsall, H.L., Hoe, V.C.W., Urquhart, D.M., Derrett, S., McBride, D., Herbison, P., Gray, A., 2013. Patterns of multisite pain and associations with risk factors. Pain, 154(9), 1769–1777.

Cohen, M.L., 1999. Is fibromyalgia a distinct clinical entity? The disapproving rheumatologist's evidence. Best Practice and Research Clinical Rheumatology, 13(3), 421–425.

Cohen, M.L., Quintner, J.L., 1993. Fibromyalgia syndrome, a problem of tautology. Lancet, 342(8876), 906–909.

Conrad, P., Barker, K.K., 2010. The social construction of illness: key insights and policy implications. Journal of Health and Social Behavior, 51(Supplement), S67–79.

Cornally, N., McCarthy, G., 2011. Help-seeking behaviour for the treatment of chronic pain. British Journal of Community Nursing, 16(2), 90–98.

Crofford, L.J., Clauw, D.J., 2002. Fibromyalgia: Where are we a decade after the American College of Rheumatology classification criteria were developed? Arthritis and Rheumatism, 46(5), 1136–1138.

Croft, P., Rigby, A.S., Boswell, R., Schollum, J., Silman, A., 1993. The prevalence of chronic widespread pain in the general population. The Journal of Rheumatology, 20(4), 710–713.

Croft, P., Schollum, J., Silman, A., 1994. Population study of tender point counts and pain as evidence of fibromyalgia. British Medical Journal, 309(6956), 696–699.

Croft, P., Burt, J., Schollum, J., Thomas, E., Macfarlane, G., Silman, A., 1996. More pain, more tender points: is fibromyalgia just one end of a continuous spectrum? Annals of the Rheumatic Diseases, 55(7), 482–485.

Dans, L., Tankeh-Torres, S., Penserga, E., 1997. The prevalence of rheumatic diseases in a Filipino urban population: a WHO-ILAR COPCORD study. The Journal of Rheumatology, 24(9), 1814–1819.

Davatchi, F., Jamshidi, A.-R., Tehrani Banihashemi, A., Gholami, J., Hossein Forouzanfar, M., Akhlaghi, M., Barghamdi, M., Noorolahzadeh, E., Khabazi, A.-R., Salesi, M., Salari, A.-H., Karimifar, M., Essalat-Manesh, K., Hajialiloo, M., Soroosh, M., Farzad, F., Moussavi, H.-R., Samadi, F., Ghaznavi, K., Asgharifard, H., Zangiabadi, A.-H., Shahram, F., Nadji, A., Akbarian, M., Gharibdoost, F., 2008. WHO-ILAR COPCORD Study (Stage 1, Urban Study) in Iran. The Journal of Rheumatology, 35(7), 1384-1390.

Davatchi, F., Tehrani Banihashemi, A., Gholami, J., Faezi, S.T., Hossein Forouzanfar, M., Salesi, M., Karimifar, M., Essalatmanesh, K., Barghamdi, M., Noorolahzadeh, E., Dahaghin, S., Rasker, J.J., 2009a. The prevalence of musculoskeletal complaints in a rural area in Iran: a WHO-ILAR COPCORD study (stage 1, rural study) in Iran. Clinical Rheumatololgy, 28(11), 1267–1274.

Davatchi, F., Jamshidi, A.-R., Tehrani Banihashemi, A., Gholami, J., Hossein Forouzanfar, M., Akhlaghi, M., Barghamdi, M., Noorolahzadeh, E., Khabazi, A.-R., Salesi, M., Salari, A.-H., Karimifar, M., Essalat-Manesh, K., Hajialiloo, M., Soroosh, M., Farzad, F., Moussavi, H.-R., Samadi, F., Ghaznavi, K., Asgharifard, H., Zangiabadi, A.-H., Shahram, F., Nadji, A., Akbarian, M., Gharibdoost, F., Rasker, J.J., 2009b. Effect of ethnic origin (Caucasians versus Turks) on the prevalence of rheumatic diseases: a WHO-ILAR COPCORD urban study in Iran. Clinical Rheumatology, 28(11), 1275–1282.

Davidson, K.E., 2010. A modified systematic review of the prevalence of chronic widespread pain in the general population. MRes. Keele University.

Davies, K.A., Silman, A.J., Macfarlane, G.J., Nicholl, B.I., Dickens, C., Morriss, R., Ray, D., Mcbeth, J., 2009a. The association between neighbourhood socio-economic status and the onset of chronic widespread pain: results from the EPIFUND study. European Journal of Pain, 13(6), 635–640.

Davies, K.A., Macfarlane, G.J., McBeth, J., Morriss, R., Dickens, C., 2009b. Insecure attachment style is associated with chronic widespread pain. Pain, 143(3), 200–205.

de Lusignan, S., Wells, S.E., Hague, N.J., Thiru, K., 2003. Managers see the problems associated with coding clinical data as a technical issue whilst clinicians also see cultural barriers. Methods of Information in Medicine, 42(4), 416–422.

de Lusignan, S., 2005. The barriers to clinical coding in general practice: a literature review. Medical Informatics and the Internet in Medicine, 30(2), 89–97.

de Lusignan, S., 2006. The optimum granularity for coding diagnostic data in primary care: report of a workshop of the EFMI Primary Care Informatics Working Group at MIE 2005. Informatics in Primary Care, 14(2), 133–137.

de Lusignan, S., Wells, S.E., Hague, N.J., Thiru, K., 2003. Managers see the problems associated with coding clinical data as a technical issue whilst clinicians also see cultural barriers. Methods of Information in Medicine, 42(4), 416–422.

de Lusignan, S., Metsemakers, J.F., Houwink, P., Gunnarsdottir, V., der Lei, van, J., 2006. Routinely collected general practice data: goldmines for research? A report of the European Federation for Medical Informatics Primary Care Informatics Working Group (EFMI PCIWG) from MIE2006, Maastricht, The Netherlands. Informatics in Primary Care, 14(3), 203–209.

Department of Health Informatics Directorate, TRUD, 2000. NHS Clinical Terminology Browser (version 1.04) [computer program]. Available at <http://www.uktcregistration.nss.cfh.nhs.uk/trud3/user/guest/group/2/pack/7/subpack/8/releases> [Accessed 10th October 2010].

Doran, T., Fullwood, C., Gravelle, H., Reeves, D., Kontopantelis, E., Hiroeh, U., Roland, M., 2006. Pay-for-performance programs in family practices in the United Kingdom. New England Journal of Medicine, 355(4), 375–384.

Doran, T., Fullwood, C., Kontopantelis, E., Reeves, D., 2008. Effect of financial incentives on inequalities in the delivery of primary clinical care in England: analysis of clinical activity indicators for the quality and outcomes framework. Lancet, 372(9640), 728–736.

Downs, S.H., Black, N., 1998. The feasibility of creating a checklist for the assessment of the methodological quality both of randomised and non-randomised studies of health care interventions. British Medical Journal, 52(6), 377–384.

EBSCO, 2013. CINAHL Complete | Full-Text Nursing Journals | EBSCO. [online] Available at: <http://www.ebscohost.com/nursing/products/cinahl-databases/cinahl-complete> [Accessed 25th November 2013].

Eggermont, L.H.P., Shmerling, R.H., Leveille, S.G., 2010. Tender point count, pain, and mobility in the older population: the mobilize Boston study. Journal of Pain, 11(1), 62–70.

Ehrlich, G.E., 2003a. Fibromyalgia, a virtual disease. Clinical Rheumatology, 22(1), 8–11.

Ehrlich, G.E., 2003b. Pain is real; fibromyalgia isn't. The Journal of Rheumatology, 30(8), 1666–1667.

Eisenberg, L., 1988. The social construction of mental illness. Psychological Medicine, 18(1), 1–9.

Elstad, J.I., 1994. Self-reported fibromyalgia among women aged 36–55 years. Tidsskrift for den Norske Laegeforening, 114(8), 914–917.

Endresen, G.K.M., 2007. Fibromyalgia: a rheumatologic diagnosis? Rheumatology International, 27(11), 999–1004.

Engel, G.L., 1977. The need for a new medical model: a challenge for biomedicine. Science, 196(4286), 129–136.

Escobar, J.I., Hoyos-Nervi, C., Gara, M., 2002. Medically unexplained physical symptoms in medical practice: a psychiatric perspective. Environmental Health Perspectives, 110 (Supplement 4), 631–636.

Farooqi, A., Gibson, T., 1998. Prevalence of the major rheumatic disorders in the adult population of north Pakistan. British Journal of Rheumatology, 37(5), 491–495.

Faulconer, E.R., de Lusignan, S., 2004. An eight-step method for assessing diagnostic data quality in practice: chronic obstructive pulmonary disease as an exemplar. Informatics in Primary Care, 12(4), 243–254.

Felson, D.T., 2008. Comparing the prevalence of rheumatic diseases in China with the rest of the world. Arthritis Research and Therapy, 10(1), 106-200.

Fink, P., Sørensen, L., Engberg, M., Holm, M., Munk-Jørgensen, P., 1999. Somatization in primary care. Prevalence, health care utilization, and general practitioner recognition. Psychosomatics, 40(4), 330–338.

Fitzcharles, M.A., 1999. Is fibromyalgia a distinct clinical entity? The approving rheumatologist's evidence. Best Practice and Research Clinical Rheumatology, 13(3), 437–443.

Fitzcharles, M.A., Boulos, P., 2003. Inaccuracy in the diagnosis of fibromyalgia syndrome: analysis of referrals. Rheumatology, 42(2), 263–267.

Fleckenstein, J., Zaps, D., Rüger, L.J., Lehmeyer, L., Freiberg, F., Lang, P.M., Irnich, D., 2010. Discrepancy between prevalence and perceived effectiveness of treatment methods in myofascial pain syndrome: results of a cross-sectional, nationwide survey. BMC Musculoskeletal Disorders, 11, 32.

Flook, N.W., 2006. Primary care physicians and musculoskeletal disorders--the challenges increase. The Journal of Rheumatology, 33(1), 4–5.

Forseth, K.O., Gran, J.T., 1992. The prevalence of fibromyalgia among women aged 20-49 years in Arendal, Norway. Scandinavian Journal of Rheumatology, 21(2), 74–78.

Forseth, K.O., Gran, J.T., 1993. The occurrence of fibromyalgia-like syndromes in a general female population. Clinical Rheumatology, 12(1), 23–27.

Forseth, K.O., Gran, J.T., Husby, G., 1997. A population study of the incidence of fibromyalgia among women aged 26-55 yr. British Journal of Rheumatology, 36(12), 1318–1323.

Forseth, K.O., Førre, O., Gran, J.T., 1999. A 5.5 year prospective study of self-reported musculoskeletal pain and of fibromyalgia in a female population: significance and natural history. Clinical Rheumatology, 18(2), 114–121.

Foster, A., Jordan, K., Croft, P., 2006. Is frequent attendance in primary care disease-specific? Family Practice, 23(4), 444–452.

Gallagher, A.M., Thomas, J.M., Hamilton, W.T., White, P.D., 2004. Incidence of fatigue symptoms and diagnoses presenting in UK primary care from 1990 to 2001. Journal of the Royal Society of Medicine 97(12), 571–575.

Gamez-Nava, J.I., Gonzalez-Lopez, L., Davis, P., Suarez-Almazor, M.E., 1998. Referral and diagnosis of common rheumatic diseases by primary care physicians. British Journal of Rheumatology, 37(11),1215–1219.

Gansky, S.A., Plesh, O., 2007. Widespread pain and fibromyalgia in a biracial cohort of young women. The Journal of Rheumatology, 34(4), 810–817.

Ganuza, F.J.R., Sotillos, A.E., 1992. The prevalence of fibrositis. Revista Clinica Espanola, 190(5), 280.

Gedalia, A., Press, J., Klein, M., Buskila, D., 1993. Joint hypermobility and fibromyalgia in schoolchildren. Annals of Rheumatic Disease, 52(7), 494–496.

Gerdle, B., Bjork, J., Cöster, L., Henriksson, K., Henriksson, C., Bengtsson, A., 2008. Prevalence of widespread pain and associations with work status: a population study. BMC Musculoskeletal Disorders, 9, 102.

Ghazan-Shahi, S., Towheed, T., Hopman, W., 2012. Should rheumatologists retain ownership of fibromyalgia? A survey of Ontario rheumatologists. Clinical Rheumatology, 31(8), 1177–1181.

Gill, D., Sharpe, M., 1999. Frequent consulters in general practice: a systematic review of studies of prevalence, associations and outcome. Journal of Psychosomatic Research, 47(2), 115–130.

Glass, J.M., 2006. Cognitive dysfunction in fibromyalgia and chronic fatigue syndrome: new trends and future directions. Current Rheumatology Reports, 8(6), 425–429.

Glennon, P., 2010. Fibromyalgia Syndrome: management in primary care. Reports on Rheumatic Diseases, 6(7), 1–6.

Goldenberg, D.L., 1995. Fibromyalgia: why such controversy? Annals of the Rheumatic Diseases, 54(1), 3–5.

Goldenberg, D.L., 2004. Fibromyalgia: to diagnose or not. Is that still the question? The Journal of Rheumatology, 31(4), 633–635.

Goldenberg, D.L., 2009. Diagnosis and Differential Diagnosis of Fibromyalgia. The American Journal of Medicine, 122(12), S14–S21.

Gordon, D.A., 2003. Fibromyalgia—real or imagined? The Journal of Rheumatology, 30(8),1665–1665.

Gowers, W.R., 1904. A Lecture on Lumbago: Its Lessons and Analogues: Delivered at the National Hospital for the Paralysed and Epileptic. British Medical Journal, 1(2246), 117–121.

Granges, G., Littlejohn, G., 1993. Prevalence of Myofascial Pain Syndrome in Fibromyalgia Syndrome and Regional Pain Syndrome: A Comparative Study. Journal of Musculoskeletal Pain, 1(2), 19–35.

Graven-Nielsen, T., Wodehouse, T., Langford, R.M., Arendt-Nielsen, L., Kidd, B.L., 2012. Normalization of widespread hyperesthesia and facilitated spatial summation of deep-tissue pain in knee osteoarthritis patients after knee replacement. Arthritis and Rheumatism, 64(9), 2907–2916.

Gray, J., Orr, D., Majeed, A., 2003. Use of Read codes in diabetes management in a south London primary care group: implications for establishing disease registers. British Medical Journal, 326(7399), 1130.

Guermazi, M., Ghroubi, S., Sellami, M., Elleuch, M., Feki, H., Andre, E., Schmitt, C., Taïeb, C., Damak, J., Baklouti, S., Elleuch, M.H., 2008. Fibromyalgia prevalence in Tunisia. Tunisie Medicale, 86(9), 806–811.

Gupta, A., Silman, A.J., Ray, D., Morriss, R., Dickens, C., MacFarlane, G.J., Chiu, Y.H., Nicholl, B., McBeth, J., 2007. The role of psychosocial factors in predicting the onset of chronic widespread pain: results from a prospective population-based study. Rheumatology, 46(4), 666–671.

Guthrie, B., McLean, G., Sutton, M., 2006. Workload and reward in the Quality and Outcomes Framework of the 2004 general practice contract. The British Journal of General Practice, 56(532), 836–841.

Hadler, N.M., 2003. 'Fibromyalgia' and the medicalization of misery. The Journal of Rheumatology, 30(8), 1668–1670.

Hadler, N.M. Greenhalgh, S., 2005. Labeling woefulness: the social construction of fibromyalgia. Spine, 30(1), 1–4.

Hagen, K., Zwart, J., Svebak, S., Bovim, G., Stovner, L.J., 2005. Low socioeconomic status is associated with chronic musculoskeletal complaints among 46,901 adults in Norway. Scandinavian Journal of Public Health, 33(4), 268–275.

Haq, S.A., Darmawan, J., Islam, M.N., Uddin, M.Z., Das, B.B., Rahman, F., Chowdhury, M.A.J., Alam, M.N., Mahmud, T.A.K., Chowdhury, M.R., Tahir, M., 2005. Prevalence of rheumatic diseases and associated outcomes in rural and urban communities in Bangladesh: a COPCORD study. The Journal of Rheumatology, 32(2), 348–353.

Hardt, J., Jacobsen, C., Goldberg, J., Nickel, R., Buchwald, D., 2008. Prevalence of chronic pain in a representative sample in the United States. Pain Medicine, 9(7), 803–812.

Harkness, E.F., Macfarlane, G.J., Silman, A.J., McBeth, J., 2005. Is musculoskeletal pain more common now than 40 years ago?: Two population-based cross-sectional studies. Rheumatology, 44(7), 890–895.

Harth, M., Nielson, W., 2007. The fibromyalgia tender points: use them or lose them? A brief review of the controversy. The Journal of Rheumatology, 34(5), 914–922.

Harth, M., Nielson, W., 2009. War is over. Give peace a chance (with apologies to the late John Lennon). The Journal of Rheumatology, 36(12), 2837–2838.

Häuser, W., Eich, W., Herrmann, M., Nutzinger, D.O., Schiltenwolf, M., Henningsen, P., 2009a. Fibromyalgia syndrome: classification, diagnosis, and treatment. Deutsches Ärzteblatt International, 106(23), 383–391.

Häuser, W., Schmutzer, G., Glaesmer, H., Brähler, E., 2009b. Prevalence and predictors of pain in several body regions : Results of a representative German population survey. Der Schmerz, 23(5), 461–470.

Häuser, W., Schmutzer, G., Brähler, E., Glaesmer, H., 2009c. A cluster within the continuum of biopsychosocial distress can be labeled 'fibromyalgia syndrome' – evidence from a representative German population survey. The Journal of Rheumatology, 36(12), 2806–2812.

Häuser, W., Hayo, S., Biewer, W., Gesmann, M., Kühn-Becker, H., Petzke, F., Wilmoswky, von, H., Langhorst, J., 2010. Diagnosis of fibromyalgia syndrome-a comparison of Association of the Medical Scientific Societies in Germany, survey, and American College of Rheumatology criteria. Clinical Journal of Pain, 26(6), 505–511.

Häuser, W., Cassava, M., Üceyler, N., Klose, P., Sommer, C., 2011. Emotional, physical, and sexual abuse in fibromyalgia syndrome: a systematic review with meta-analysis. Arthritis Care and Research, 63(6), 808–820.

Häuser, W., Glaesmer, H., Schmutzer, G., Brähler, E., 2012. Widespread pain in older Germans is associated with posttraumatic stress disorder and lifetime employment status - Results of a cross-sectional survey with a representative population sample. Pain, 153(12), 2466–2472.

Häuser, W., Schmutzer, G., Hinz, A., Hilbert, A., Brähler, E., 2013. [Prevalence of chronic pain in Germany. A representative survey of the general population]. Der Schmerz, 27(1), 46–55.

Hawe, E., Yuen, P., Baillie, L., 2011. OHE guide to UK health and health care statistics. London: Office of Health Economics.

Hayden J.A., 2007. Methodological issues in systematic reviews of prognosis and prognostic factors: Low back pain. Doctoral Thesis, University of Toronto.

Hayden, J.A., van der Windt, D.A., Cartwright, J.L., Côté, P., Bombardier, C., 2013. Assessing bias in studies of prognostic factors. Annals of Internal Medicine, 158(4), 280–286.

Hellström, O., Bullington, J., Karlsson, G., Lindqvist, P., Mattsson, B., 1998. Doctors' attitudes to fibromyalgia: a phenomenological study. Scandinavian Journal of Social Medicine, 26(3), 232–237.

Hench, P.K., 1976. Nonarticular rheumatism, 22nd rheumatism review: review of the American and English literature for the years 1973 and 1974. Arthritis and Rheumatism, 19(supplement), 1081–1089.

Herrett, E., Shah, A.D., Boggon, R., Denaxas, S., Smeeth, L., van Staa, T., Timmis, A., Hemingway, H., 2013. Completeness and diagnostic validity of recording acute myocardial infarction events in primary care, hospital care, disease registry, and national mortality records: cohort study. British Medical Journal, 346, f2350.

Higgins, J.P.T., Green, S, 2009. Cochrane Handbook for Systematic Reviews of Interventions, [online]. Cochrane Collaboration. Available at: <http://www.cochrane- handbook.org/> [accessed 8th December 2009].

Higgins, J.P.T., Thompson, S.G., Deeks, J.J., Altman, D.G., 2003. Measuring inconsistency in meta-analyses. British Medical Journal, 327(7414), 557–560.

Hiller, W., Fichter, M.M., 2004. High utilizers of medical care: a crucial subgroup among somatizing patients. Journal of Psychosomatic Research, 56(4), 437–443.

Hobbs, F.D., Hawker, A., 1995. Computerised data collection: practicability and quality in selected general practices. Family Practice, 12(2), 221–226.

Hoy, D., Brooks, P., Woolf, A., Blyth, F., March, L., Bain, C., Buchbinder, R., 2012. Assessing risk of bias in prevalence studies: modification of an existing tool and evidence of interrater agreement. Journal of Clinical Epidemiology, 65(9), 934–939.

Hughes, G., Martinez, C., Myon, E., Taïeb, C., Wessely, S., 2006. The impact of a diagnosis of fibromyalgia on health care resource use by primary care patients in the UK: an observational study based on clinical practice. Arthritis and Rheumatism, 54(1), 177–183.

Hunt, I.M., Silman, A.J., Benjamin, S., McBeth, J., Macfarlane, G.J., 1999. The prevalence and associated features of chronic widespread pain in the community using the “Manchester” definition of chronic widespread pain. Rheumatology, 38(3), 275–279.

Iannuccelli, C., Spinelli, F.R., Guzzo, M.P., Priori, R., Conti, F., Ceccarelli, F., Pietropaolo, M., Olivieri, M., Minniti, A., Alessandri, C., Gattamelata, A., Valesini, G., Di Franco, M., 2012. Fatigue and widespread pain in systemic lupus erythematosus and Sjögren's syndrome: symptoms of the inflammatory disease or associated fibromyalgia? Clinical and Experimental Rheumatology, 30(6, supplement 74), 117–121.

IBM Corp. Released 2011. IBM SPSS Statistics for Windows, Version 20.0. Armonk, NY: IBM Corp.

Inanici, F.F. Yunus, M.B., 2004. History of fibromyalgia: Past to present. Current Pain and Headache Reports, 8(5), 369–378.

The Iowa Persian Gulf Study Group, 1997. Self-reported illness and health status among Gulf War veterans. A population-based study. The Iowa Persian Gulf Study Group. Journal of the American Medical Association, 277(3), 238–245.

Jacobsen, S., Bredkjaer, S.R., 1992. The prevalence of fibromyalgia and widespread chronic musculoskeletal pain in the general population. Scandinavian Journal of Rheumatology, 21(5), 261–263.

Jacobsson, L.T.H., Nagi, D.K., Pillemer, S.R., Knowler, W.C., Hanson, R.L., Pettitt, D.J., Bennett, P.H., 1996. Low prevalences of chronic widespread pain and shoulder disorders among the Pima Indians. The Journal of Rheumatology, 23(5), 907–909.

Jones, G.T., Power, C., Macfarlane, G.J., 2009. Adverse events in childhood and chronic widespread pain in adult life: Results from the 1958 British Birth Cohort Study. Pain, 143(1–2), 92–96.

Jordan, K., Porcheret, M., Croft, P., 2004. Quality of morbidity coding in general practice computerized medical records: a systematic review. Family Practice, 21(4), 396–412.

Jordan, K., Jinks, C., Croft, P., 2006. Health care utilization: measurement using primary care records and patient recall both showed bias. Journal of Clinical Epidemiology, 59(8), 791–797.

Jordan, K., Clarke, A.M., Symmons, D.P.M., Fleming, D., Porcheret, M., Kadam, U.T., Croft, P., 2007. Measuring disease prevalence: a comparison of musculoskeletal disease using four general practice consultation databases. The British Journal of General Practice, 57(543), 7–14.

Jordan, K.P., Kadam, U.T., Hayward, R., Porcheret, M., Young, C., Croft, P., 2010. Annual consultation prevalence of regional musculoskeletal problems in primary care: an observational study. BMC Musculoskeletal Disorders, 11, 144.

Jordan, K.P., Jöud, A., Bergknut, C., Croft, P., Edwards, J.J., Peat, G., Petersson, I.F., Turkiewicz, A., Wilkie, R., Englund, M., 2013. International comparisons of the consultation prevalence of musculoskeletal conditions using population-based healthcare data from England and Sweden. Annals of the Rheumatic Diseases, [online] 0, 1–7. Available at: <http://dx.doi.org/doi:10.1136/annrheumdis-2012-202634> [Accessed 27th October 2013].

Joshi, V.L., Chopra, A., 2009. Is There an Urban-Rural Divide? Population Surveys of Rheumatic Musculoskeletal Disorders in the Pune Region of India Using the COPCORD Bhigwan Model. The Journal of Rheumatology, 36(3), 614–622.

Jyväsjärvi, S., Keinänen-Kiukaanniemi, S., Väisänen, E., Larivaara, P., Kivela, S.L., 1998. Frequent attenders in a Finnish health centre: morbidity and reasons for encounter. Scandinavian Journal of Primary Health Care, 16(3), 141–148.

Jyväsjärvi, S., Keinänen-Kiukaanniemi, S., Väisänen, E., Larivaara, P., Kivela, S.L., 1998. Frequent attenders in a Finnish health centre: morbidity and reasons for encounter. Scandinavian Journal of Primary Health Care, 16(3), 141–148.

Jyväsjärvi, S., Joukamaa, M., Väisänen, E., Larivaara, P., Kivelä, S., Keinänen-Kiukaanniemi, S., 2001. Somatizing frequent attenders in primary health care. Journal of Psychosomatic Research, 50(4), 185–192.

Kadam, U.T., Thomas, E., Croft, P.R., 2005. Is chronic widespread pain a predictor of all-cause morbidity? A 3 year prospective population based study in family practice. The Journal of Rheumatology, 32(7), 1341–1348.

Kamaleri, Y., Natvig, B., Ihlebaek, C.M., Bruusgaard, D., 2008a. Localized or widespread musculoskeletal pain: Does it matter? Pain, 138(1), 41–46.

Kamaleri, Y., Natvig, B., Ihlebaek, C.M., Benth, J.S., Bruusgaard, D., 2008b. Number of pain sites is associated with demographic, lifestyle, and health-related factors in the general population. European Journal of Pain, 12(6), 742–748.

Kamaleri, Y., Natvig, B., Ihlebaek, C.M., Benth, J.S., Bruusgaard, D., 2009. Change in the number of musculoskeletal pain sites: A 14-year prospective study. Pain, 141(1–2), 25–30.

Kamoun, S., Elleuch, M., Le Lay, K., Feki, H., Taieb, C., André, E., Damak, J., Elleuch, M.H., 2010. Evaluation of knowledge of fibromyalgia in Tunisia. La Tunisie Medicale, 88(10), 703–706.

Karlsson, H., Lehtinen, V., Joukamaa, M., 1994. Frequent attenders of Finnish public primary health care: sociodemographic characteristics and physical morbidity. Family Practice, 11(4), 424–430.

Karlsson, H., Joukamaa, M., Lahti, I., Lehtinen, V., Kokki-Saarinen, T., 1997. Frequent attender profiles: different clinical subgroups among frequent attender patients in primary care. Journal of Psychosomatic Research, 42(2), 157–166.

Kato, K., Sullivan, P.F., Evengård, B., Pedersen, N.L., 2006. Chronic widespread pain and its comorbidities: a population-based study. Archives of Internal Medicine, 166(15), 1649–1654.

Katz, R.S., Wolfe, F., Michaud, K., 2006. Fibromyalgia diagnosis: a comparison of clinical, survey, and American College of Rheumatology criteria. Arthritis and Rheumatism, 54(1),169–176.

Kim, S., 2008. Prevalence of chronic widespread pain and chronic fatigue syndrome in young Korean adults. Journal of Musculoskeletal Pain 16(3), 149–153.

Kim, S., Bae, G., Lim, H., 2006. Prevalence and risk factors of fibromyalgia syndrome and chronic widespread pain in two communities in Korea-First report in Korean. The Journal of the Korean Rheumatism, 13(1), 18–1825.

Kim, S.-H., Lee, K., Lim, H.-S., 2008. Prevalence of chronic widespread pain and chronic fatigue syndrome in Korean livestock raisers. Journal of Occupational Health, 50(6), 525–528.

Kim, C., Kim, H., Kim, J., 2012. Prevalence of chronic widespread pain and fibromyalgia syndrome: a Korean hospital-based study. Rheumatology International, 32(11), 3435–3442.

Kindler, L.L., Jones, K.D., Perrin, N., Bennett, R.M., 2010. Risk factors predicting the development of widespread pain from chronic back or neck pain. Journal of Pain, 11(12), 1320–1328.

Kleinman, N., Harnett, J., Melkonian, A., Lynch, W., Kaplan-Machlis, B., Silverman, S.L., 2009. Burden of fibromyalgia and comparisons with osteoarthritis in the workforce. Journal of Occupational and Environmental Medicine, 51(12), 1384–1393.

Klemp, P., Williams, S., Stansfield, S., 2002. Fibromyalgia in Maori and European New Zealanders. APLAR Journal of Rheumatology, 5(1), 1–5.

Kumar, P., Pullar, T., 2003. Perceptions of fibromyalgia among rheumatologists in Scotland. Rheumatology, 42(supplement 1), 60–61.

Kurita, G.P., Sjøgren, P., Juel, K., Højsted, J., Ekholm, O., 2012. The burden of chronic pain: A cross-sectional survey focussing on diseases, immigration, and opioid use. Pain, 153(12), 2332–2338.

Lacey, R.J., Lewis, M., Jordan, K., Jinks, C., Sim, J., 2005. Interrater reliability of scoring of pain drawings in a self-report health survey. Spine, 30 (16), E455–E458.

Lacourt, T., Houtveen, J., van Doornen, L., 2013. 'Functional somatic syndromes, one or many?' An answer by cluster analysis. Journal of Psychosomatic Research, 74(1), 6–11.

Lascuevas, P.M., Garcia, F.J.B., Mejia, R.H., Espinar, A.C., 1995. Prevalence of localized pain of the locomotor system in the general population. Atencion Primaria/Sociedad Espanola de Medicina de Familia y Comunitaria, 15(7), 449–451.

Lawrence, R.C., Helmick, C.G., Arnett, F.C., Deyo, R.A., Felson, D.T., Giannini, E.H., Heyse, S.P., Hirsch, R., Hochberg, M.C., Hunder, G.G., Liang, M.H., Pillemer, S.R., Steen, V.D., Wolfe, F., 1998. Estimates of the prevalence of arthritis and selected musculoskeletal disorders in the United States. Arthritis and Rheumatism, 41(5), 778–799.

Lawrence, R., Felson, D., Helmick, C., Arnold, L., Choi, H., Deyo, R., Gabriel, S., Hirsch, R., Hochberg, M., Hunder, G., 2008. Estimates of the prevalence of arthritis and other rheumatic conditions in the United States: Part II. Arthritis and Rheumatism, 58(1), 26–35.

Leveille, S.G., Zhang, Y., McMullen, W., Kelly-Hayes, M., Felson, D.T., 2005. Sex differences in musculoskeletal pain in older adults. Pain, 116(3), 332–338.

Liberati, A., Altman, D.G., Tetzlaff, J., Mulrow, C., Gøtzsche, P.C., Ioannidis, J.P.A., Clarke, M., Devereaux, P.J., Kleijnen, J., Moher, D., 2009. The PRISMA statement for reporting systematic reviews and meta-analyses of studies that evaluate health care interventions: explanation and elaboration. Annals of Internal Medicine, 151(4), W65–94.

Lindell, L., Bergman, S., Petersson, I.F., Jacobsson, L.T., Herrström, P., 2000. Prevalence of fibromyalgia and chronic widespread pain. Scandinavian Journal of Primary Health Care, 18(3), 149–153.

Linsell, L., Dawson, J., Zondervan, K., Rose, P., Randall, T., Fitzpatrick, R., Carr, A., 2006. Prevalence and incidence of adults consulting for shoulder conditions in UK primary care; patterns of diagnosis and referral. Rheumatology, 45(2), 215–221.

Louw, Q.A., Morris, L.D., Grimmer-Somers, K., 2007. The Prevalence of low back pain in Africa: a systematic review. BMC Musculoskeletal Disorders, 8(1), 105.

Luciano, J.V., Fernández, A., Pinto-Meza, A., Luján, L., Bellón, J.A., García-Campayo, J., Peñarrubia, M.T., Fernández, R., Sanavia, M., Blanco, M.E., Haro, J.M., Palao, D.J., Serrano-Blanco, A., 2010. Frequent attendance in primary care: comparison and implications of different definitions. The British Journal of General Practice, 60(571), 49–55.

Lydell, C., Meyers, O.L., 1992. The prevalence of fibromyalgia in a South African Community. Scandinavian Journal of Rheumatology, 94 (supplement), 8.

Macfarlane, G.J., 1999. Generalized pain, fibromyalgia and regional pain: an epidemiological view. Baillière's Best Practice and Research Clinical Rheumatology, 13(3), 403–414.

Macfarlane, G.J., Croft, P.R., Schollum, J., Silman, A.J., 1996a. Widespread pain: Is an improved classification possible? The Journal of Rheumatology, 23(9), 1628–32.

Macfarlane, G.J., Thomas, E., Papageorgiou, A.C., Schollum, J., Croft, P.R., Silman, A.J., 1996b. The natural history of chronic pain in the community: a better prognosis than in the clinic? The Journal of Rheumatology, 23(9), 1617–1620.

Macfarlane, G.J., Morris, S., Hunt, I.M., Benjamin, S., McBeth, J., Papageorgiou, A.C., Silman, A.J., 1999. Chronic widespread pain in the community: the influence of psychological symptoms and mental disorder on healthcare seeking behavior. The Journal of Rheumatology, 26(2), 413–419.

Macfarlane, G.J., McBeth, J., Silman, A.J., Crombie, I.K., 2001. Widespread body pain and mortality: prospective population based study Commentary: An interesting finding, but what does it mean?. British Medical Journal, 323(7314), 662–662.

Macfarlane, T.V., Blinkhorn, A., Worthington, H.V., Davies, R.M., Macfarlane, G.J., 2002. Sex hormonal factors and chronic widespread pain: a population study among women. Rheumatology, 41(4), 454–457.

Macfarlane, G.J., Palmer, B., Roy, D., Afzal, C., Silman, A.J., O'Neill, T., 2005. An excess of widespread pain among South Asians: are low levels of vitamin D implicated?. Annals of the Rheumatic Diseases, 64(8), 1217–1219.

Macfarlane, G.J., Jones, G.T., Knekt, P., Aromaa, A., McBeth, J., Mikkelsson, M., Heliovaara, M., 2007. Is the report of widespread body pain associated with long-term increased mortality? Data from the Mini-Finland Health Survey. Rheumatology, 46(5), 805–807.

Macfarlane, G.J., Norrie, G., Atherton, K., Power, C., Jones, G.T., 2009a. The influence of socioeconomic status on the reporting of regional and widespread musculoskeletal pain: results from the 1958 British Birth Cohort Study. Annals of the Rheumatic Diseases, 68(10), 1591–1595.

Macfarlane, G.J., Pye, S.R., Finn, J.D., Wu, F.C.W., Silman, A.J., Bartfai, G., Boonen, S., Casanueva, F., Forti, G., Giwercman, A., Han, T.S., Huhtaniemi, I.T., Kula, K., Lean, M.E.J., O'Neill, T.W., Pendleton, N., Punab, M., Vanderschueren, D., European Male Ageing Study Group, 2009b. Investigating the determinants of international differences in the prevalence of chronic widespread pain: evidence from the European Male Ageing Study. Annals of the Rheumatic Diseases, 68(5), 690–695.

Mäkelä, M., Heliövaara, M., 1991. Prevalence of primary fibromyalgia in the Finnish population. British Medical Journal, 303(6796), 216–219.

Marrie, R.A., Yu, B.N., Leung, S., Elliott, L., Warren, S., Wolfson, C., Tremlett, H., Blanchard, J., Fisk, J.D., 2012. The incidence and prevalence of fibromyalgia are higher in multiple sclerosis than the general population: A population-based study. Multiple Sclerosis and Related Disorders, 1(4), 162–167.

Marschall, U., Arnold, B., Häuser, W., 2011. Treatment and healthcare costs of fibromyalgia syndrome in Germany: analysis of the data of the Barmer health insurance (BEK) from 2008–2009. Der Schmerz, 25(4), 402–410.

Martinez-Lavin, M., 2001. Overlap of fibromyalgia with other medical conditions. Current Pain And Headache Reports, 5(4), 347–350.

Mas, A.J., Carmona, L., Valverde, M., Ribas, B., Study, G.E., 2008. Prevalence and impact of fibromyalgia on function and quality of life in individuals from the general population: results from a nationwide study in Spain. Clinical and Experimental Rheumatology, 26(4), 519–526.

McBeth, J., Mulvey, M.R., 2012. Fibromyalgia: mechanisms and potential impact of the ACR 2010 classification criteria. Nature Reviews Rheumatology, 8(2), 108–116.

McBeth, J., Macfarlane, G.J., Benjamin, S., Morris, S., Silman, A.J., 1999. The association between tender points, psychological distress, and adverse childhood experiences: a community-based study. Arthritis and Rheumatism, 42(7), 1397–1404.

McBeth, J., Macfarlane, G.J., Hunt, I.M., Silman, A.J., 2001a. Risk factors for persistent chronic widespread pain: a community-based study. Rheumatology, 40(1), 95–101.

McBeth, J., Macfarlane, G.J., Benjamin, S., Silman, A.J., 2001b. Features of somatization predict the onset of chronic widespread pain: results of a large population-based study. Arthritis and Rheumatism, 44(4), 940–946.

McBeth, J., Chiu, Y.H., Silman, A.J., Ray, D., Morriss, R., Dickens, C., Gupta, A., Macfarlane, G.J., 2005. Hypothalamic-pituitary-adrenal stress axis function and the relationship with chronic widespread pain and its antecedents. Arthritis Research and Therapy, 7(5), R992–R1000.

McBeth, J., Symmons, D.P., Silman, A.J., Allison, T., Webb, R., Brammah, T., Macfarlane, G.J., 2009. Musculoskeletal pain is associated with a long-term increased risk of cancer and cardiovascular-related mortality. Rheumatology, 48(1), 74–77.

McBeth, J., Prescott, G., Scotland, G., Lovell, K., Keeley, P., Hannaford, P., McNamee, P., Symmons, D.P.M., Woby, S., Gkazinou, C., Beasley, M., Macfarlane, G.J., 2012. Cognitive behavior therapy, exercise, or both for treating chronic widespread pain. Archives of Internal Medicine, 172(1), 48–57.

McNally, J.D., Matheson, D.A., Bakowsky, V.S., 2006. The epidemiology of self-reported fibromyalgia in Canada. Chronic Diseases in Canada, 27(1), 9–16.

Mease, P.J., Clauw, D.J., Arnold, L.M., Goldenberg, D.L., Witter, J., Williams, D.A., Simon, L.S., Strand, C.V., Bramson, C., Martin, S., Wright, T.M., Littman, B., Wernicke, J.F., Gendreau, R.M., Crofford, L.J., 2005. Fibromyalgia syndrome. The Journal of Rheumatology, 32(11), 2270–2277.

Mekentosj, 2001–2013. Papers2, software, version 2.6.4 for Mac OS. Mekentosj B.V., The Netherlands.

Middleton, G.D., McFarlin, J.E., Lipsky, P.E., 1994. The prevalence and clinical impact of fibromyalgia in systemic lupus erythematosus. Arthritis and Rheumatism, 37(8), 1181–1188.

Mikkelsson, M., Salminen, J.J., Kautiainen, H., 1997. Non-specific musculoskeletal pain in preadolescents. Prevalence and 1-year persistence. Pain, 73(1), 29–35.

Minaur, N., Sawyers, S., Parker, J., Darmawan, J., 2004. Rheumatic disease in an Australian Aboriginal community in North Queensland, Australia. A WHO-ILAR COPCORD survey. The Journal of Rheumatology, 31(5), 965–972.

Montanes, M.L.R., Gil, N.P., Villar, C.A., Anton, L.P., 1995. Prevalence of generalized pain of the locomotor system. Atencion Primaria/Sociedad Espanola de Medicina de Familia y Comunitaria, 16(6), 379–380.

Moss-Morris, R., Weinman, J., Petrie, K., Horne, R., Cameron, L., Buick, D., 2002. The revised illness perception questionnaire (IPQ-R). Psychology and Health, 17(1), 1–16.

National Institute for Health and Care Excellence, 2008. Osteoarthritis: The care and management of osteoarthritis in adults. [NICE clinical guideline 59]. London: National Institute for Health and Care Excellence.

National Institute for Health and Care Excellence, 2013. Evidence Services Health Information Resources – AMED. [online] Available at: <http://www.library.nhs.uk/help/resource/amed> [Accessed 25th November 2013].

National Library of Medicine, 2013. MEDLINE/PubMed Resources Guide. [online] Available at: <http://www.nlm.nih.gov/bsd/pmresources.html> [Accessed 26th September 2013].

Natvig, B., Picavet, H.S., 2002. The epidemiology of soft tissue rheumatism. Best Practice and Research in Clinical Rheumatology, 16(5), 777–793.

Neal, R.D., Heywood, P.L., Morley, S., Clayden, A.D., Dowell, A.C., 1998. Frequency of patients' consulting in general practice and workload generated by frequent attenders: comparisons between practices. The British Journal of General Practice, 48(426), 895–898.

Newcombe, R.G., 1998. Two-sided confidence intervals for the single proportion: comparison of seven methods. Statistics in Medicine, 17(8), 857–872.

Nickel, R. and Raspe, H.H., 2001. Chronic pain: epidemiology and receiving treatment. Nervenarzt, 72(12), 897–906.

Nilsson, G., Ahlfeldt, H., Strender, L.-E., 2002. Computerisation, coding, data retrieval and related attitudes among Swedish general practitioners-a survey of necessary conditions for a database of diseases and health problems. International Journal of Medical Informatics, 65(2), 135–143.

Nimnuan, C., Hotopf, M., Wessely, S., 2001a. Medically unexplained symptoms: an epidemiological study in seven specialities. Journal of Psychosomatic Research, 51(1), 361–367.

Nimnuan, C., Rabe-Hesketh, S., Wessely, S., Hotopf, M., 2001b. How many functional somatic syndromes? Journal of Psychosomatic Research, 51(4), 549–557.

Office for National Statistics, 2005. The National Statistics Socio-economic classification user manual. 2005 edition. London: ONS.

Office for National Statistics, 2011. Vital Statistics: Population and Health Reference Tables, Autumn 2011 update [online] Available at: <http://www.ons.gov.uk/ons/publications/re-reference-tables.html?edition=tcm%3A77-223131> [accessed 11th October 2011]

Ospina M, Harstall C., 2002. Prevalence of chronic pain: an overview. Edmonton: Alberta Heritage Foundation for Medical Research (AHFMR), 61.

Ostuni, P., Botsios, C., Sfriso, P., Punzi, L., Chieco-Bianchi, F., Semerano, L., Grava, C., Todesco, S., 2002. Fibromyalgia in Italian patients with primary Sjogren's syndrome. Joint Bone Spine, 69(10), 51–57.

Øverland, S., Harvey, S.B., Knudsen, A.K., Mykletun, A., Hotopf, M., 2012. Widespread pain and medically certified disability pension in the Hordaland Health Study. European Journal of Pain, 16(4), 611–620.

Ovid, 2013. Embase | Ovid. [online] Available at: <http://www.ovid.com/webapp/wcs/stores/servlet/ProductDisplay?storeId=13051&catalogId=13151&langId=-1&partNumber=Prod-903> [Accessed 26th September 2013].

Pakhomov, S.S.V., Hemingway, H., Weston, S.A., Jacobsen, S.J., Rodeheffer, R., Roger, V.L., 2007. Epidemiology of angina pectoris: Role of natural language processing of the medical record. American Heart Journal, 153(4), 666–673.

Palmer, B., Macfarlane, G., Afzal, C., Esmail, A., Silman, A., Lunt, M., 2007. Acculturation and the prevalence of pain amongst South Asian minority ethnic groups in the UK. Rheumatology, 46(6), 1009–1014.

Papageorgiou, A.C., Silman, A.J., Macfarlane, G.J., 2002. Chronic widespread pain in the population: a seven year follow up study. Annals of the Rheumatic Diseases, 61(12), 1071–1074.

Pastor, M.A., López-Roig, S., Johnston, M., Gracia, R., Daza, P., 2012. Clinical self-efficacy and illness beliefs in ambiguous chronic pain conditions: General Practitioners' management of Fibromyalgia. Anales de Psicología, 28(2), 417–425.

Payne, R.A., Abel, G.A., 2012. UK indices of multiple deprivation - a way to make comparisons across constituent countries easier. Health Statistics Quarterly, 53, 22–37.

Pearson, N., O'Brien, J., Thomas, H., Ewings, P., Gallier, L., Bussey, A., 1996. Collecting morbidity data in general practice: the Somerset morbidity project. British Medical Journal, 312(7045), 1517–1520.

Peat, G., Greig, J., Wood, L., Wilkie, R., Thomas, E., Croft, P., 2005. Diagnostic discordance: we cannot agree when to call knee pain "osteoarthritis". Family Practice, 22(1), 96–102.

Pelaez-Ballestas, I., Sanin, L.H., Moreno-Montoya, J., Alvarez-Nemegyei, J., Burgos-Vargas, R., Garza-Elizondo, M., Rodriguez-Amado, J., Goycochea-Robles, M.V., Madariaga, M., Zamudio, J., Santana, N., Cardiel, M.H., 2011. Epidemiology of the rheumatic diseases in Mexico. A study of 5 regions based on the COPCORD methodology. The Journal of Rheumatology, 38(S86), 3–6.

Perrot, S., Vicaut, E., Servant, D., Ravaud, P., 2011. Prevalence of fibromyalgia in France: a multi-step study research combining national screening and clinical confirmation: The DEFI study (Determination of Epidemiology of FIbromyalgia). BMC Musculoskeletal Disorders, 12, 224.

Perrot, S., Choy, E., Petersel, D., Ginovker, A., Kramer, E., 2012. Survey of physician experiences and perceptions about the diagnosis and treatment of fibromyalgia. BMC Health Services Research, 12, 356.

Picavet, H.S.J., Hazes, J.M.W., 2003. Prevalence of self reported musculoskeletal diseases is high. Annals of Rheumatic Disease, 62(7), 644–650.

Porcheret, M., Hughes, R., Evans, D., Jordan, K., Whitehurst, T., Ogden, H., Croft, P., 2004. Data quality of general practice electronic health records: the impact of a program of assessments, feedback, and training. Journal of the American Medical Informatics Association, 11(1), 78–86.

Prescott, E., Kjøller, M., Jacobsen, S., Bülow, P.M., Danneskiold-Samsøe, B., Kamper-Jørgensen, F., 1993. Fibromyalgia in the adult Danish population: I. A prevalence study. Scandinavian Journal of Rheumatology, 22(5), 233–237.

ProQuest LLC, 2013. RefWorks 2.0, Web Based Bibliographic Management Software. [online] Available from <http://www.refworks.com> [Accessed: 10th September 2013].

Queiroz, L.P., 2013. Worldwide epidemiology of fibromyalgia. Current Pain and Headache Reports, 17(78), 356–356.

Quintner, J.L., Cohen, M.L.,1999. Fibromyalgia falls foul of a fallacy. Lancet, 353(9158),1092–1094.

Raspe, H., Baumgartner, C., 1993. The epidemiology of the fibromyalgia syndrome FMS: Different criteria-different results. Journal of Musculoskeletal Pain, 1(3–4), 149–152.

Reid, S., Whooley, D., Crayford, T., Hotopf, M., 2001a. Medically unexplained symptoms—GPs' attitudes towards their cause and management. Family Practice, 18(5), 519–523.

Reid, S., Wessely, S., Crayford, T., Hotopf, M., 2001b. Medically unexplained symptoms in frequent attenders of secondary health care: retrospective cohort study. British Medical Journal, 322(7289), 767–770.

Reid, S., Wessely, S., Crayford, T., Hotopf, M., 2002. Frequent attenders with medically unexplained symptoms: service use and costs in secondary care. British Journal of Psychiatry, 180(3), 248–253.

Reid, K.J., Harker, J., Bala, M.M., Truyers, C., Kellen, E., Bekkering, G.E., Kleijnen, J., 2011. Epidemiology of chronic non-cancer pain in Europe: Narrative review of prevalence, pain treatments and pain impact. Current Medical Research and Opinion, 27(2), 449–462.

Reyes-Llerena, G.A., Guibert-Toledano, M., Hernández Martínez, A.A., González Otero, Z.A., Alcocer Varela, J., Cardiel, M.H., Community Oriented Programme for the Control of Rheumatic Diseases, 2000. Prevalence of musculoskeletal complaints and disability in Cuba. A community-based study using the COPCORD core questionnaire. Clinical and Experimental Rheumatology, 18(6), 739–742.

Reyes-Llerena, G.A., Guibert-Toledano, M., Penedo-Coello, A., Perez-Rodriguez, A., Baez-Duenas, R.M., Charnicharo-Vidal, R., Cardiel, M.H., 2009. Community-based study to estimate prevalence and burden of illness of rheumatic diseases in Cuba: a COPCORD study. Journal of Clinical Rheumatology, 15(2), 51–55.

Reynolds, M.D., 1983. The development of the concept of fibrositis. Journal of the History of Medicine and Allied Sciences, 38(1), 5–35.

Ring, A., Dowrick, C., Humphris, G., Salmon, P., 2004. Do patients with unexplained physical symptoms pressurise general practitioners for somatic treatment? A qualitative study. British Medical Journal, 328(7447), 1057–1050.

Ring, A., Dowrick, C.F., Humphris, G.M., Davies, J., Salmon, P., 2005. The somatising effect of clinical consultation: what patients and doctors say and do not say when patients present medically unexplained physical symptoms. Social Science and Medicine, 61(7), 1505–1515.

Rodriguez-Amado, J., Pelaez-Ballestas, I., Sanin, L.H., Esquivel-Valerio, J.A., Burgos-Vargas, R., Perez-Barbosa, L., Riega-Torres, J., Garza-Elizondo, M.A., 2011. Epidemiology of Rheumatic Diseases. A Community-Based Study in Urban and Rural Populations in the State of Nuevo Leon, Mexico. The Journal of Rheumatology, 86, 9–14.

Rohrbeck, J., 2002. Chronic widespread pain and its associated features: a case-control study in primary care. MPhil. Keele University.

Rohrbeck, J., Jordan, K., Croft, P., 2007. The frequency and characteristics of chronic widespread pain in general practice: a case-control study. The British Journal of General Practice, 57(535), 109–115.

Russell, I.J., 2006. The prevalence of the fibromyalgia syndrome in China. Journal of Musculoskeletal Pain, 14(2), 1–2.

Rustøen, T., Wahl, A.K., Hanestad, B.R., Lerdal, A., Paul, S., Miaskowski, C., 2004. Prevalence and characteristics of chronic pain in the general Norwegian population. European Journal of Pain, 8(6), 555–565.

Salaffi, F., De Angelis, R., Grassi, W., Prevalence, M.P., 2005. Prevalence of musculoskeletal conditions in an Italian population sample: results of a regional community-based study. I. The MAPPING study. Clinical and Experimental Rheumatology 23(6), 819–828.

Salisbury, C., Procter, S., Steward, K., Bowen, L., Purdy, S., Ridd, M., Valderas, J., Blakeman, T., Reeves, D., 2013. The content of general practice consultations: cross-sectional study based on video-recordings. Manuscript submitted for publication.

Salmon, P., Dowrick, C.F., Ring, A. Humphris, G.M., 2004. Voiced but unheard agendas: qualitative analysis of the psychosocial cues that patients with unexplained symptoms present to general practitioners. The British Journal of General Practice, 54(500), 171–176.

Sanderson, S., Tatt, L.D., Higgins, J.P.T., 2007. Tools for assessing quality and susceptibility to bias in observational studies in epidemiology: a systematic review and annotated bibliography. International Journal of Epidemiology, 36(3), 666–676.

Santos, A.M.B., Burti, J.S., Lopes, J.B., Scazufca, M., Marques, A.P., Pereira, R.M.R., 2010. Prevalence of fibromyalgia and chronic widespread pain in community-dwelling elderly subjects living in São Paulo, Brazil. Maturitas, 67(3), 251–255.

Sarkozi, J., 2009. Fibromyalgia and the fallacy of pain from nowhere. The Journal of Rheumatology, 36(12), 2836–2837.

Sauer, K., Kemper, C., Glaeske, G., 2011. Fibromyalgia syndrome: Prevalence, pharmacological and non-pharmacological interventions in outpatient health care. An analysis of statutory health insurance data. Joint Bone Spine, 78(1), 80–84.

Sayer, G.P., Britt, H., 1996. Sex differences in morbidity: a case of discrimination in general practice. Social Science and Medicine, 42(2), 257–264.

Schochat, T., Raspe, H., 1995. The epidemiology and fibromyalgia and the nosological background - Results from a population based study in Bad Sackingen, Germany. Aktuelle Rheumatologie, 20(3), 105–111.

Schochat, T., Raspe, H., 2003. Elements of fibromyalgia in an open population. Rheumatology, 42(7), 829–835.

Schochat, T., Croft, P., Raspe, H., 1994. The epidemiology of fibromyalgia. Workshop of the Standing Committee on Epidemiology European League Against Rheumatism (EULAR), Bad Sackingen, 19–21 November 1992. British Journal of Rheumatology, 33(8), 783–786.

Scudds, R.A., Li, E.K.M., Scudds, R.J., 2006. The prevalence of fibromyalgia syndrome in Chinese people in Hong Kong. Journal of Musculoskeletal Pain, 14(2), 3–11.

Senna, E.R., De Barros, A.L.P., Silva, E.O., Costa, I.F., Pereira, L.V.B., Ciconelli, R.M., Ferraz, M.B., 2004. Prevalence of rheumatic diseases in Brazil: a study using the COPCORD approach. The Journal of Rheumatology, 31(3), 594–597.

Sensky, T., MacLeod, A. K., Rigby, M. F., 1996. Causal attributions about common somatic sensations among frequent general practice attenders. Psychological Medicine, 26(3), 641–646.

Shamliyan, T., Kane, R.L., Dickinson, S., 2010. A systematic review of tools used to assess the quality of observational studies that examine incidence or prevalence and risk factors for diseases. Journal of Clinical Epidemiology, 63(10), 1061–1070.

Shir, Y., Fitzcharles, M.A., 2009a. Should rheumatologists retain ownership of fibromyalgia? The Journal of Rheumatology, 36(4), 667–670.

Shir, Y., Fitzcharles, M.A., 2009b. Drs. Shir and Fitzcharles reply. The Journal of Rheumatology, 36(12), 2839–2839.

Shleyfer, E., Jotkowitz, A., Karmon, A., Nevzorov, R., Cohen, H., Buskila, D., 2009. Accuracy of the diagnosis of fibromyalgia by family physicians: is the pendulum shifting? The Journal of Rheumatology, 36(1), 170–173.

Simpson, C.R., Anandan, C., Fischbacher, C., Lefevre, K., Sheikh, A., 2007. Will Systematized Nomenclature of Medicine-Clinical Terms improve our understanding of the disease burden posed by allergic disorders? Clinical and Experimental Allergy, 37(11), 1586–1593.

Smits, F.T., Mohrs, J.J., Beem, E.E., Bindels, P.J., van Weert, H.C., 2008. Defining frequent attendance in general practice. BMC Family Practice, 9(1), 21.

Smits, F.T.M., Brouwer, H.J., Riet, ter, G., van Weert, H.C.P., 2009. Epidemiology of frequent attenders: a 3-year historic cohort study comparing attendance, morbidity and prescriptions of one-year and persistent frequent attenders. BMC Public Health, 9, 36.

Smythe, H., 1972. Nonarticular rheumatism and psychogenic musculoskeletal syndromes. In: McCarty, D.J., ed.1972, Arthritis and Allied Conditions. 8th edition. Philadelphia: Lea and Fiber, 881–891.

Smythe, H. A., Moldofsky, H., 1977. Two contributions to understanding of the "fibrositis" syndrome. Bulletin on the Rheumatic Diseases, 28(1), 928–931.

StataCorp, 2011. Stata Statistical Software: Release 12. College Station, TX: StataCorp LP.

Stimpson, N.J., Unwin, C., Hull, L., David, T., Wessely, S., Lewis, G., 2006. Prevalence of reported pain, widespread pain, and pain symmetry in veterans of the Persian Gulf War (1990–1991): the use of pain manikins in Persian Gulf War health research. Military Medicine, 171(12), 1181–1186.

Stone, C., 1999. Science in the Art of Osteopathy: Osteopathic principles and practice. Cheltenham: Nelson Thornes.

Stormorken, H., Waaler, H.T., Ruste, L.A., 1994. Month of birth and prevalence of fibromyalgia. Tidsskrift for den Norske Laegeforening, 114(10), 1207–1208.

Storozhenko, O., Lesniak, O., Macfarlane, G., McBeth, J., 2004. The prevalence of chronic generalized pain and its relationship to demographic characteristics and mental status. Klin Med (Mosk), 82(9), 48–52.

Stroup, D.F., Berlin, J.A., Morton, S.C., Olkin, I., Williamson, G.D., Rennie, D., Moher, D., Becker, B.J., Sipe, T.A., Thacker, S.B. and Moose GRP, 2000. Meta-analysis of observational studies in epidemiology - A proposal for reporting. Journal of the American Medical Association, 283(15), 2008–2012.

Sutton, M., McLean, G., 2006. Determinants of primary medical care quality measured under the new UK contract: cross sectional study. British Medical Journal, 332(7538), 389–390.

Svebak, S., Hagen, K., Zwart, J., 2006. One-Year Prevalence of Chronic Musculoskeletal Pain in a Large Adult Norwegian County Population: Relations with Age and Gender-The HUNT Study. Journal of Musculoskeletal Pain, 14(1), 21–28.

Tai, T.W., Anandarajah, S., Dhoul, N., de Lusignan, S., 2007. Variation in clinical coding lists in UK general practice: a barrier to consistent data entry? Informatics in Primary Care, 15(3), 143–150.

Thiru, K., Hassey, A., Sullivan, F., 2003. Systematic review of scope and quality of electronic patient record data in primary care. British Medical Journal, 326(7398), 1070.

Thomas, E., Peat, G., Harris, L., Wilkie, R., Croft, P.R., 2004a. The prevalence of pain and pain interference in a general population of older adults: cross-sectional findings from the North Staffordshire Osteoarthritis Project (NorStOP). Pain, 110(1–2), 361–368.

Thomas, E., Wilkie, R., Peat, G., Hill, S., Dziedzic, K., Croft, P., 2004b. The North Staffordshire Osteoarthritis Project--NorStOP: prospective, 3-year study of the epidemiology and management of clinical osteoarthritis in a general population of older adults. BMC Musculoskeletal Disorders, 5, 2.

Thorson, K., 1999. Is fibromyalgia a distinct clinical entity? The patient's evidence. Best Practice and Research Clinical Rheumatology, 13(3), 463–467.

Topbas, M., Cakirbay, H., Gulec, H., Akgol, E., Ak, I., Can, G., 2005. The prevalence of fibromyalgia in women aged 20–64 in Turkey. Scandinavian Journal of Rheumatology, 34(2), 140–144.

Traut, E.F., 1968. Fibrositis. Journal of the American Geriatrics Society, 16(5), 531–538.

Turhanoglu, A., Yilmaz, S., Kaya, S., Dursun, M., Kararmaz, A., Saka, G., 2008. The Epidemiological Aspects of Fibromyalgia Syndrome in Adults Living in Turkey: A Population Based Study. Journal of Musculoskeletal Pain, 16(3), 141–147.

van de Kar, A., Knottnerus, A., Meertens, R., Dubois, V., Kok, G., 1992. Why do patients consult the general practitioner? Determinants of their decision. The British Journal of General Practice, 42(361), 313–316.

Van Den Kerkhof, E.G., Macdonald, H.M., Jones, G.T., Power, C., Macfarlane, G.J., 2011. Diet, lifestyle and chronic widespread pain: results from the 1958 British Birth Cohort Study. Pain Research and Management, 16(2), 87–92.

Vedsted, P., Christensen, M.B., 2005. Frequent attenders in general practice care: A literature review with special reference to methodological considerations. Public Health, 119(2), 118–137.

Veerapen, K., Wigley, R.D., Valkenburg, H., 2007. Musculoskeletal pain in Malaysia: a COPCORD survey. The Journal of Rheumatology, 34(1), 207–213.

Verhaak, P.F., Kerssens, J.J., Dekker, J., Sorbi, M.J., Bensing, J.M., 1998. Prevalence of chronic benign pain disorder among adults: a review of the literature. Pain, 77(3), 231–239.

Vincent, A., Lahr, B.D., Wolfe, F., Clauw, D.J., Whipple, M.O., Oh, T.H., Barton, D.L., St Sauver, J., 2013. Prevalence of fibromyalgia: a population-based study in olmsted county, Minnesota, utilizing the Rochester epidemiology project. Arthritis Care and Research, 65(5), 786–792.

Von Korff, M., Simon, G., 1996. The relationship between pain and depression. British Journal of Psychiatry, Supplement (30), 101–108.

Wade, D.T., Halligan, P.W., 2004. Do biomedical models of illness make for good healthcare systems? British Medical Journal, 329(7479), 1398–1401.

Walitt, B., Fitzcharles, M.-A., Hassett, A.L., Katz, R.S., Häuser, W., Wolfe, F., 2011. The longitudinal outcome of fibromyalgia: a study of 1555 patients. The Journal of Rheumatology, 38(10), 2238–2246.

Wang, Y.C., McPherson, K., Marsh, T., Gortmaker, S.L., Brown, M., 2011. Health and economic burden of the projected obesity trends in the USA and the UK. Lancet, 378 (9793), 815–825.

Ware, J.E., Sherbourne, C.D., 1992. The MOS 36-item short-form health survey (SF-36). I. Conceptual framework and item selection. Medical Care, 30(6), 473–483.

Ware, J., Kosinski, M., Keller, S.D., 1996. A 12-Item Short-Form Health Survey: construction of scales and preliminary tests of reliability and validity. Medical Care, 34(3), 220–233.

Wells GA , Shea B, O'Connell D, Peterson J, Welch V, Losos M, Tugwell P., 2008. The Newcastle-Ottawa Scale (NOS) for assessing the quality of non-randomized studies in meta-analyses. [online] Department of Epidemiology and Community Medicine, University of Ottawa, Canada. Available from: <http://www.lri.ca/programs/ceu/oxford.htm> [accessed 25th August 2010].

Wenzel, H.G., Mykletun, A., Nilsen, T.I.L., 2009. Symptom profile of persons self-reporting whiplash: a Norwegian population-based study (HUNT 2). European Spine Journal, 18(9), 1363–1370.

Wessely, S., 1990. Old wine in new bottles: neurasthenia and 'ME'. Psychological Medicine, 20(1), 35–53.

Wessely, S., Hotopf, M.,1999. Is fibromyalgia a distinct clinical entity? Historical and epidemiological evidence. Baillière's Best Practice and Research Clinical Rheumatology, 13(3), 427–436.

Wessely, S., White, P.D. 2004. There is only one functional somatic syndrome. The British Journal of Psychiatry, 185, 95–96.

Wessely, S., Nimnuan, C., Sharpe, M., 1999. Functional somatic syndromes: one or many? Lancet, 354(9182), 936–939.

White, K.P. Harth, M., 2001. Classification, epidemiology, and natural history of fibromyalgia. Current Pain And Headache Reports, 5(4), 320–329.

White, K.P., Thompson, J., 2003. Fibromyalgia syndrome in an Amish community: a controlled study to determine disease and symptom prevalence. The Journal of Rheumatology, 30(8), 1835–1840.

White, K.P., Speechley, M., Harth, M., Ostbye, T., 1999. The London Fibromyalgia Epidemiology Study: the prevalence of fibromyalgia syndrome in London, Ontario. The Journal of Rheumatology, 26(7), 1570–1576.

White, K. P., Nielson, W. R., Harth, M., Ostbye, T., Speechley, M., 2002a. Does the label "fibromyalgia" alter health status, function, and health service utilization? A prospective, within-group comparison in a community cohort of adults with chronic widespread pain. Arthritis Care and Research, 47(3), 260–265.

White, K.P., Nielson, W.R., Harth, M., Ostbye, T., Speechley, M., 2002b. Chronic widespread musculoskeletal pain with or without fibromyalgia: Psychological distress in a representative community adult sample. The Journal of Rheumatology, 29(3), 588–594.

WHO, 2000. Obesity: preventing and managing the global epidemic. Report of a WHO Consultation. WHO Technical Report Series, 894. Geneva: World Health Organization.

Williams, P.H., de Lusignan, S., 2006. Does a higher "quality points" score mean better care in stroke? An audit of general practice medical records. Informatics in Primary Care, 14(1), 29–40.

Wolfe, F., 1993. The epidemiology of fibromyalgia. Journal of Musculoskeletal Pain, 1(3–4), 137–148.

Wolfe, F., 1997. The relation between tender points and fibromyalgia symptom variables: evidence that fibromyalgia is not a discrete disorder in the clinic. Annals of Rheumatic Diseases, 56(4), 268–271.

Wolfe, F., 2003. Stop using the American College of Rheumatology criteria in the clinic. The Journal of Rheumatology, 30(8), 1671–1672.

Wolfe, F. 2009a. Fibromyalgia wars. The Journal of Rheumatology, 36(4), 671–678.

Wolfe, F. 2009b. Fibromyalgia Wars–II Dr. Wolfe replies. The Journal of Rheumatology, 36(12), 2840.

Wolfe, F., 2009c. Fibromyalgianess. Arthritis and Rheumatism, 61(6), 715–716.

Wolfe, F., 2010. New American College of Rheumatology criteria for fibromyalgia: a twenty-year journey. Arthritis Care and Research, 62(5), 583–584.

Wolfe, F., Cathey, M.A., 1983. Prevalence of primary and secondary fibrositis. The Journal of Rheumatology, 10(6), 965–968.

Wolfe, F., Michaud, K., 2004. Severe rheumatoid arthritis (RA), worse outcomes, comorbid illness, and sociodemographic disadvantage characterize RA patients with fibromyalgia. The Journal of Rheumatology, 31(4), 695–700.

Wolfe, F., Walitt, B., 2013. Culture, science and the changing nature of fibromyalgia. Nature Reviews. Rheumatology. Advance online publication: doi: 10.1038/nrrheum.2013.96.

Wolfe, F., Smythe, H.A., Yunus, M.B., Bennett, R.M., Bombardier, C., Goldenberg, D.L., Tugwell, P., Campbell, S.M., Abeles, M., Clark, P., Fam, A.G., Farber, S.J., Fiechtner, J.J. Franklin, C.M., Gatter, R.A., Hamaty, D., Lessard, J., Lichtbroun, A.S., Masi, A.T., Mccain, G.A.,1990. The

American College of Rheumatology 1990 Criteria for the Classification of Fibromyalgia - Report of the Multicenter Criteria Committee. Arthritis and Rheumatism, 33(2), 160–172.

Wolfe, F., Simons, D.G., Fricton, J., Bennett, R.M., Goldenberg, D.L., Gerwin, R., Hathaway, D., McCain, G.A., Russell, I.J., Sanders, H.O., 1992. The fibromyalgia and myofascial pain syndromes: a preliminary study of tender points and trigger points in persons with fibromyalgia, myofascial pain syndrome and no disease. The Journal of Rheumatology, 19(6), 944–951.

Wolfe, F., Ross, K., Anderson, J., Russell, I.J., Hebert, L., 1995. The prevalence and characteristics of fibromyalgia in the general population. Arthritis and Rheumatism, 38(1), 19–28.

Wolfe, F., Anderson, J., Harkness, D., Bennett, R.M., Caro, X.J., Goldenberg, D.L., Russell, I.J., Yunus, M.B., 1997. Health status and disease severity in fibromyalgia: results of a six-center longitudinal study. Arthritis and Rheumatism, 40(9), 1571–1579.

Wolfe, F., Petri, M., Alarcon, G.S., Goldman, J., Chakravarty, E.F., Katz, R.S., Karlson, E.W., 2009. Fibromyalgia, systemic lupus erythematosus (SLE), and evaluation of SLE activity. The Journal of Rheumatology, 36(1), 82–88.

Wolfe, F., Clauw, D.J., Fitzcharles, M.-A., Goldenberg, D.L., Katz, R.S., Mease, P., Russell, A.S., Russell, I.J., Winfield, J.B., Yunus, M.B., 2010. The American College of Rheumatology preliminary diagnostic criteria for fibromyalgia and measurement of symptom severity. Arthritis Care and Research, 62(5), 600–610.

Wolfe, F., Clauw, D. J., Fitzcharles, M. A., Goldenberg, D. L., Häuser, W., Katz, R. S., Mease, P., Russell, A.S., Russell, I.J.,Winfield, J. B., 2011a. Fibromyalgia criteria and severity scales for clinical and epidemiological studies: a modification of the ACR Preliminary Diagnostic Criteria for Fibromyalgia. The Journal of Rheumatology, 38(6), 1113–1122.

Wolfe, F., Häuser, W., Hassett, A.L., Katz, R.S., Walitt, B.T., 2011b. The development of fibromyalgia—I: examination of rates and predictors in patients with rheumatoid arthritis (RA). Pain, 152(2), 291–299.

Wolfe, F., Brähler, E., Hinz, A., Häuser, W., 2013. Fibromyalgia prevalence, somatic symptom reporting, and the dimensionality of polysymptomatic distress: results from a survey of the general population. Arthritis Care and Research, 65(5), 777–785.

Wolters Kluwer, 2013. OvidSP. [online] Available from <http://ovidsp.ovid.com/autologin.cgi> [Accessed: 10th September 2013].

Yunus, M., Masi, A.T., Calabro, J.J., Miller, K.A., Feigenbaum, S.L., 1981. Primary fibromyalgia (fibrositis): clinical study of 50 patients with matched normal controls. Seminars in Arthritis and Rheumatism, 11(1), 151–171.

Zapata, A.L., Moraes, A.J.P., Leone, C., Doria-Filho, U., Silva, C.A.A., 2006. Pain and musculoskeletal pain syndromes in adolescents. Journal of Adolescent Health, 38(6), 769–771.

Zeng, Q., Chen, R., Darmawan, J., Xiao, Z., Chen, S., Wigley, R., Le Chen, S., Zhang, N., 2008. Rheumatic Diseases in China. Arthritis Research and Therapy, 10(1), R17.

Zeng, Q.Y., Zang, C.H., Lin, L., Chen, S.B., Li, X.F., Xiao, Z.Y., Dong, H.Y., Zhang, A.L., Chen, R., 2010. Epidemiologic study of soft tissue rheumatism in Shantou and Taiyuan, China. Chinese Medical Journal, 123(15), 2058–2062.

Zigmond, A.S., Snaith, R.P., 1983. The hospital anxiety and depression scale. Acta Psychiatrica Scandinavia, 67(6), 361–370.

Appendix
Chapter 3 appendix

A3.1 Database specific search strategies

Table A3.1 Medline – limit to human, 1990–current.

Pain term	Keywords searched for in abstract and title	(TI “chronic widespread pain” OR “fibromyalgia” OR “chronic pain syndrome” OR “diffuse pain” OR “fibrositis” OR “fibromyositis” OR “myofascial pain syndrome”) **OR** (AB “chronic widespread pain” OR “fibromyalgia” OR “chronic pain syndrome” OR “diffuse pain” OR “fibrositis” OR “fibromyositis” OR “myofascial pain syndrome”)
		OR
	MeSH headings	(MH "Fibromyalgia") OR (MH "Myofascial Pain Syndromes")
		AND
Study type term	Keywords searched for in abstract and title	“epidemiology” OR “cohort stud*” OR “cohort analys*” OR “cross sectional stud*” OR “cross sectional analys*” OR “observational analys*” OR “prevalence” OR “disease frequency”
		OR
	MeSH headings	(MH "Prevalence") OR (MH "Cross-Sectional Studies") OR (MH "Epidemiologic Measurements") OR (MH "Epidemiologic Methods") OR (MH "Epidemiologic Research Design") OR (MH "Epidemiology") OR (MH "Cohort Studies")

Table A3.2 AMED – 1990–current.

Pain term	Keywords searched for in abstract and title	(TI “chronic widespread pain” OR “fibromyalgia” OR “chronic pain syndrome” OR “diffuse pain” OR “fibrositis” OR “fibromyositis” OR “myofascial pain syndrome”) **OR** (AB “chronic widespread pain” OR “fibromyalgia” OR “chronic pain syndrome” OR “diffuse pain” OR “fibrositis” OR “fibromyositis” OR “myofascial pain syndrome”)
		OR
	Subject headings	(DE "FIBROMYALGIA") OR (DE "PAIN")
		AND
Study type term	Keywords searched for in abstract and title	“epidemiology” OR “cohort stud*” OR “cohort analys*” OR “cross sectional stud*” OR “cross sectional analys*” OR “observational analys*” OR “prevalence” OR “disease frequency”
		OR
	Subject headings	(DE "EPIDEMIOLOGY")

Table A3.3 EMBASE – limit to human, 1990–current.

Pain term	Keywords searched for in abstract and title	(chronic widespread pain OR fibromyalgia OR chronic pain syndrome OR diffuse pain OR fibrositis OR fibromyositis OR myofascial pain syndrome).ab,ti.
		OR
	Emtree subject headings	(fibromyalgia/epidemiology OR myofascial pain/epidemiology).sh.
		AND
Study type term	Keywords searched for in abstract and title	(epidemiology OR cohort stud* OR cohort analys* OR cross sectional stud* OR cross sectional analys* OR observational analys* OR prevalence OR disease frequency).ab,ti.
		OR
	Emtree subject headings	(epidemiology OR prevalence OR cross sectional study).sh.

Table A3.4 CINAHL – limit to human, 1990–current.

Pain term	Keywords searched for in abstract and title	(TI “chronic widespread pain” OR “fibromyalgia” OR “chronic pain syndrome” OR “diffuse pain” OR “fibrositis” OR “fibromyositis” OR “myofascial pain syndrome”)
		OR
		(AB “chronic widespread pain” OR “fibromyalgia” OR “chronic pain syndrome” OR “diffuse pain” OR “fibrositis” OR “fibromyositis” OR “myofascial pain syndrome”)
		OR
	Subject headings	(MH "Fibromyalgia") OR (MH "Myofascial Pain Syndromes")
		AND
Study type term	Keywords searched for in abstract and title	“epidemiology” OR “cohort stud*” OR “cohort analys*” OR “cross sectional stud*” OR “cross sectional analys*” OR “observational analys*” OR “prevalence” OR “disease frequency”
		OR
	Subject headings	(MH "Prevalence") OR (MH "Cross Sectional Studies") OR (MH "Epidemiology") OR (MH "Epidemiological Research") OR (MH "Prospective Studies")

A3.2 Data extraction sheet and quality appraisal tool

Data Extraction Sheet

Citation

Study objective

Sample size | Location | Age

Gender | Condition(s) for which prevalence figures calculated

Citations to follow up

Fibromyalgia

FM prev | FM prev 95% CI lower limit | FM prev 95% CI upper limit

FM prev women | FM prev women 95% CI lower limit | FM prev women 95% CI upper limit

FM prev men | FM prev men 95% CI lower limit | FM prev men 95% CI upper limit

Chronic Widespread Pain

CWP prev | CWP prev 95% CI lower limit | CWP prev 95% CI upper limit

CWP prev women | CWP prev women 95% CI lower limit | CWP prev women 95% CI upper limit

CWP prev men | CWP prev men 95% CI lower limit | CWP prev men 95% CI upper limit

Prevalence stratified by age/other factors

Methodological Quality Assessment Tool

Study Type

Population

Sample selection

Sampling frame

Response rate

Data collection methods

Clinical examination

Data collection instrument

Time period for prevalence

Diagnostic criteria

Have any steps been taken by the authors to minimise bias or to validate either the data collected, their methods of data collection or the tools used to collect data?

Validation/blinding

Tool developed from Walker et al, 2000, cited in: Louw, Q.A., Morris, L.D., Grimmer-Somers, K., 2007. The Prevalence of low back pain in Africa: a systematic review. BMC musculoskeletal disorders 8, 105.

A. Is the final sample representative of the target population?

A.1. At least one of the following must apply in the study: an entire target population, randomly selected sample, or sample stated to represent the target population.

A.1 Sample selection

A.2. At least one of the following: reasons for nonresponse described, non-responders described, comparison of responders and non-responders, or comparison of sample and target populations.

A.2 Non-response

A.3. Response rate (and, if applicable drop-out rate) reported.

A.3 Response rate

A. Study sample comments

B. Quality of the data

B.4. Was the same mode of data collection used for all subjects?

B.4 Data collection

B.5. Were the data collected from each respondent directly or were they collected from a proxy?

B.5 Data collected directly

B.6. In the case of a questionnaire, at least one of the following: a validated questionnaire or at least tested for reproducibility.

B.6 Questionnaire validity

B.7. In the case of an interview, at least one of the following: interview validated; tested for reproducibility; or adequately described and standardised.

B.7 Interview validity

B.8. In the case of an examination, at least one of the following: Examination validated; tested for reproducibility; or adequately described and standardised.

B.8 Examination validity

B.9. Was prevalence calculated as a direct estimate from the whole sample?

B.9 Direct estimate of prevalence

B.10. Was any statement given regarding time point for prevalence figures (point/period prevalence)?

B.10 Time point for prevalence

B. Data quality comments

C. Case definition

C.11. Were clear diagnostic criteria for CWP/FM stated?

C.11 Diagnostic criteria stated

C. Case definition comments

QUality In Prognosis Studies (QUIPS) Tool

Domain: 1. Study Participation

Target population	A clear description of who the target population is (the target population for this review is older adults in the general population), when (time period of study), where (location), how (description of recruitment strategy) and why the population was chosen, to allow the reader to determine if the target population was captured.	QUIPS1.1
Sampling frame	The sampling frame and procedures used to sample subjects (e.g. newspaper advertisement, presentation to a health clinic, or captured from a claims database) should not lead to selection of participants that are systematically different from eligible non-participants.	QUIPS1.2
Inclusion criteria	The inclusion and exclusion criteria used should define the study population. Inclusion/exclusion criteria should not select participants that are systematically different from eligible non-participants.	QUIPS1.3
Baseline study population	A clear description of who ends up in the study, sufficient to allow the reader to judge potential selection bias relative to the target population.	QUIPS1.4
Adequate study participation	It is important for studies to clearly report the proportion of eligible subjects who participate in the study, although it is not possible to set a criteria for an 'adequate' (or inadequate) participation rate. Studies should report factors associated with non-response, quantify and interpret these associations to determine if it is a selective sample. For example, a low participation raises suspicion that there may be a barrier to participating that may influence outcomes.	QUIPS1.5
Estimates of population parameters	Are any estimates of population parameters based on figures calculated from data observed in the whole sample, or extrapolated from rates observed in a sub-sample? - ie are all participants examined	QUIPS1.6

Study participation summary question: synthesise the 'considerations' above to judge the risk of selection bias

After thorough reflection on all considerations, how would you describe the judgment about the risk of selection bias (low, moderate or high)?

QUIPS 1 Summary

List reasons for rating:

QUIPS 1 Rating Justification

for e.g.: Low risk of selection bias – due to: Complete participation by those eligible to participate; Incomplete participation, but there is evidence that participation was not likely to be related to the prognostic factor and outcome.

Hayden, J.A., Côté, P., Bombardier, C., 2006. Evaluation of the quality of prognosis studies in systematic reviews (No. 6), Annals of Internal Medicine.

QUality In Prognosis Studies (QUIPS) Tool

Domain: 4. Outcome Measurement

Definition of outcome	There is a clear operationalisation of the outcome of interest, including how it is assessed and when (time points), related to the conceptual framework. Criteria for case definition are clearly stated.	QUIPS4.1
Valid & reliable measure of outcome	Outcomes are measured in a valid, reliable way that allows you to assess the opportunity for misclassification of individuals (e.g are data records accurate and complete, have study questions been understood by participants?). Measures that are uncommon or have been modified should provide evidence of reliability and validity. Whenever possible, validated instruments should be used.	QUIPS4.2
Method & setting of outcome measurement	The measurement approach, timing, and setting of assessment should be standardised across subjects, or conducted in a way that limits systematically different measurement. If there are differences, this should be reported and the implications should be considered.	QUIPS4.3

Outcome measurement summary question: synthesise the 'considerations' above to judge the risk of measurement bias related to the outcome.

After thorough reflection on all considerations, how would you describe the judgment about the overall risk of measurement bias due to the outcome measure (low, moderate or high)? For studies that contain outcome measures, where some outcomes are low risk and others are high risk, such studies are scored as “moderate risk of bias”

QUIPS 4 Summary

List reasons for rating:

QUIPS 4 Rating Justification

for e.g.: Low risk – due to: Measurement of the outcome is valid, reliable and similar for all subjects; There are differences or uncertainty in measurement but there is evidence that it is not likely to be related to the stratifying factor.

Hayden, J.A., Côté, P., Bombardier, C., 2006. Evaluation of the quality of prognosis studies in systematic reviews (No. 6), Annals of Internal Medicine.

A3.3 Studies excluded after review of full text

Table A3.5 Papers excluded after review of full text.

Reason for exclusion		Paper
Prevalence figures for CWP/FM not quoted or could not be calculated from the information provided in the paper (n=16)	No prevalence figures for FM/ CWP	Davies et al. 2009a Fleckenstein et al. 2010 Zeng et al. 2008
	Identified widespread pain but gave no measure of chronicity	Adamson et al. 2007 Harkness et al. 2005 Lascuevas et al. 1995 Leveille et al. 2005 Mikkelsson et al. 1997 Palmer et al. 2007 Thomas et al. 2004a Gerdle et al. 2008 Cho et al. 2012 Häuser et al. 2012
	Identified chronic pain but provided no measure of pain location	Rustøen et al. 2004
	Figures for myofascial pain syndrome	Chaiamnuay et al. 1998
	Figures for soft tissue rheumatism	Andrianakos et al. 2003
Not primary research (n=11)	Editorials or letters	Felson 2008 Russell 2006 Ganuza & Sotillos 1992 Jacobsen & Bredkjaer 1992 Montanes et al. 1995
	Review articles or used secondary data presented in other papers already included in the review.	Blanco et al. 2007 Cavalcante et al. 2006 Lawrence et al. 2008 Lawrence et al. 1998 Wolfe et al. 1993 Zeng et al. 2010
Not cross-sectional or cohort study (n=2)		Marrie et al. 2012 Stormorken et al. 1994
Study population was not representative of the general population (n=6)		Cimmino et al. 2002 Kim et al. 2008 Kim et al. 2012 Kleinman et al. 2009 Kurita et al. 2012 Lydell and Meyers 2009 (conference abstract)
Document data analysed in other papers included in the review (paper included in review) (n=13)		Abusdal et al.1997b (Abusdal et al.1997a) Atherton et al. 2009 (Macfarlane et al. 2009b) Bannwarth et al. 2009 (Branco et al. 2010) Bazelmans et al.1997 (Bazelmans et al.1999) Bergman et al. 2002 (Bergman et al. 2001) Davatchi et al. 2009b (Davatchi et al. 2008) Gedalia et al.1993 (Buskila et al. 1993) Jones et al. 2009 (Macfarlane et al. 2009b) Mas et al.2008 (Carmona et al. 2001) McBeth et al. 2001b (Hunt et al. 1999) Schochat and Raspe 1995 (Schochat and Raspe 2003) Wenzel et al. 2009 (Svebak et al. 2006)

A3.4 Methodological quality: justification of ratings for QUIPS tool domain 1

Table A3.6 Risk of selection bias and justification for rating using domain 1 of the QUIPS methodological quality assessment tool.

Study	Risk of bias	Rating Justification
Ablin et al. 2012	high	Very small response rate (30%) and respondents recruited by telephone which systematically excludes those without a home telephone. In addition no information is provided regarding the time of day of the call (daytime only calls systematically exclude daytime workers) or any effort made to reach those not answering a call first time. There is no information provided regarding the target population or non-responders to compare with the study sample to establish if the study sample is different to non-responders or the target population. Estimates of prevalence using extrapolation from data observed in rheumatology outpatients in not a robust estimate of general population prevalence as rheumatology outpatients are likely to be systematically different to the general population.
Abusdal et al. 1997a	low	Moderate response rate (response rate 65%), but there is evidence that participation was not likely to bias outcome as 'the sample is considered representative for Norwegian women in Oslo'.
Aggarwal et al. 2006	low	High participation rate, clear comparison of responders vs non-responders. Only question is whether residents of Handforth, Manchester are representative of the UK general population.
Alvarez-Nemegyei et al. 2005	moderate	High participation rates, but unclear how sample selected and unclear if sample is representative of target population and population parameters estimated based on extrapolation from figures observed in screen positives only.
Alvarez-Nemegyei et al. 2011	high	Unclearly defined target population (age not stated), sampling frame not stated, insufficient detail regarding sampling process, no information regarding response rate, possible disparity in gender distribution in sample vs population suggests selection bias.
Andersson 1994	moderate	Incomplete participation, but there is evidence that participation was not related to outcome. Evidence suggests that the sample is representative of the residents of Bromölla and Simrishamn, however unclear if sample reflective of the 'rural population of Sweden' as stated in the title. Figures for FM extrapolated from examination of sample of those that responded positively to CWP.
Andersson et al. 1999	low	Representative nature of primary care registered population, participation not likely to be related to outcome (however, possibility for bias here as no comparison given of responders vs non-responders, but assume small influence)
Assumpção et al. 2009	high	Non-random sample selection for screening phase; recruitment of sample by telephone when 27% of target population do not have a telephone and 30% of those called did not answer the phone; recruitment to examination phase based on participant agreement – highly likely to lead to a systematically different group of patients.
Bazelmans et al. 1999	moderate	Likelihood of sample being non-representative of GPs. If we consider this a measure of 'diagnostic prevalence' (interplay of clinical opinion and consulting behaviour) then a response rate of 60% would seem reasonable, however, it would seem fair to suggest that those that didn't not return the questionnaire were likely to be Drs who did not agree with the diagnosis, therefore making their estimates of prevalence lower, resulting in an over-estimation of coding (or diagnostic) prevalence.
Bergman et al. 2001	low	Random selection from appropriate sampling frame (however, unclear if two regions selected are representative of the whole of the general population of Sweden), good response rate and clear description of non-responders sufficient to provide evidence that participation unrelated to outcome measure.
Branco et al. 2010	moderate	Unclear sampling frame, insufficient information presented regarding non-responders, recruitment conducted by telephone (excludes those without a landline and those not in at the time of call > responders likely to be systematically different to non-responders) – however, sample stated to be representative of the general population – therefore moderate rather than high risk of selection bias.

Study	Risk of bias	Rating Justification
Buskila et al. 1993	high	Sample selected non-randomly from one school only, cannot generalise the results to all children. Insufficient information available to decide whether it's possible to even generalise to other schools in the same area, as no information is given regarding the school population or location. Insufficient evidence provided to determine whether the sample is reflective of the sampling frame population since no information given regarding response rate/ non-responders vs responders.
Buskila et al. 2000	low	Good participation rate, non-responders described, responders compared with 1993 Israel census data, gender distribution of sample found to deviate from census data, however analysis takes this into account (figures adjusted for age and gender).
Cakirbay et al. 2006	low	Good participation rate and participants likely to be reflective of the target population, however unclear who was examined in the examination phase.
Cardiel & Serrano 2002	low	While no response rate is given and there is no description of non responders, evidence from comparison with year 2000 Mexican national census shows comparable age and gender distribution in sample.
Carmona et al. 2001	low	Sample demonstrated to be comparable to general population. While response rate moderate at 73%, there is clear comparison of the study sample to Spanish general population data derived from Institute of National Statistics 1999 or 1997, on age, gender, urban/city residence, level of education, type of employment, social class, employment status, showing sample to be representative of the general population. Non-responders are demonstrated to be similar to responders, with the exception of place of residence, higher response rate in villages.
Carnes et al. 2007	moderate	A reasonable, but not ideal response rate of 60%. The study population is demonstrated to be older (mean age 52 years) and more likely to be female (56% female). No discussion regarding non-responders is provided. Must therefore conclude at least a moderate risk of selection bias.
Chaaya et al. 2012	low	Sample selected using random multistage cluster selection and stated to be representative of the general population of Lebanon. Selected from main centers and randomly selected villages from all 26 Lebanese districts. Study sample stated to be representative of general population on age and gender distribution. High response rate to initial screening (83%) and reasonable response rate to follow-up examination of screen positives.
Chen et al. 2008	high	Participants self selected by responding to an advert offering free health checks to participants. No information provided allowing comparison of sample demographics to population demographics to judge the representative nature of the sample.
Choudhury et al. 2013 (long)	high	While response rate was high (94%), patients were recruited from a GP waiting room thereby automatically selecting a group of the population more likely to be unwell. Quota sampling was used to help ensure a representative sample, but who to approach was still at the discretion of the interviewer and was therefore likely to be biased. The paper argues that since the aim of the study was not to calculate robust prevalence estimates, but to make comparisons between prevalence in the white and Bangladeshi populations thereby making some of my arguments irrelevant however, I would counter that to make meaningful comparisons between prevalence estimates for groups from different ethnic backgrounds sampling of these groups needs to be representative.
Choudhury et al. 2013 (short)	high	Very low response rate (27%) and the exclusion of patients with pain due established pathophysiological diagnoses, since CWP can coexist with its differential diagnoses. There is insufficient documentation regarding non-responders and no comparison made between study sample and target population, therefore given the very low response rate we must consider this study to be at high risk of participation bias.
Clark et al. 1998	high	Children selected from 3 schools in one area, might not be representative of the whole Mexican population. Children selected from public schools only, excludes privately educated children. Participants recruited by attendance on the days of the study, excludes children who were not at school, systematically selects only well students.
Croft et al. 1993	low	Good (corrected) response rate, comparison been responders and non-responders shows some difference (responders were more likely to be female and in current employment). Short questionnaire completed by a sample of non-responders showed that they were less likely to have chronic pain compared to those who did (suggests that study may slightly overestimate prevalence) but examination of rates of consultation for pain complaints shows little difference between responders and non-responders so effect of participation bias unlikely to be large.

Study	Risk of bias	Rating Justification
Dans et al. 1997	moderate	While we can assume that recruitment to the screening phase will have led to a representative sample (high response rate, assuming sample selection process valid), however responders to examination phase shown to be systematically different to non-responders (non-responders more likely to be male, younger and less likely to have any physical limitation).
Davatchi et al. 2008	moderate	Good response rate and study participants selected randomly, however recruitment of participants on a weekend may have lead to participation bias, this is supported by the finding of a different age and gender distribution when study sample was compared with results from a 1996 census. However, comparison of 2004–2006 study to 1996 data (results have been standardised to 1996 population) might not be appropriate.
Davatchi et al. 2009a	moderate	Random selection of participants from sampling frame, with a reasonable response rate, however, unclear how sampling frame arrived at, unclear if sampling frame representative of rural Iran. While a description of the baseline study population is given this is not compared with target population.
Eggermont et al. 2010	moderate	Little documentation provided in this paper regarding sample selection and non-responders. It is assumed that this information is provided in another publication, but must assume at least a moderate risk of bias as the study only includes the first 600 participants enrolled in the MOBILIZE Boston study, therefore need to assume that there is a possibility of first responders being systematically different from all participants enrolled.
Elstad 1994	moderate	Sample is selected randomly for a variety of regions in Norway. However, response rate is low (54%) and no description is provided of non-responders. Comparison is made between study sample and Statistics Norway Living Conditions Survey 1991 (which had a drop-out rate of 22%), the study samples were felt to be comparable, however, this is not sufficient evidence to give a low risk of selection bias.
Farooqi & Gibson 1998	moderate	While response rates are high, it is unclear how/why the 3 areas were selected and whether they are representative of the target populations, no comparison is made between target and sample populations to make this judgement and no information is provided regarding the demographics of the sample to be able to research this. Recruitment strategy is unclear, however seem to have attempted to recruit all residents of the selected area with a good response rate, so perhaps the detail of the recruitment strategy is less important in this
Forseth & Gran 1992	moderate	While there is a high response rate, there is no description of non-responders or comparison of responders to the population. It may be likely that the questionnaire study sample is representative of the target population, however, it may be that the random sample of positive responders are not representative. Insufficient information about how the sample selected for examination was selected. Overall must conclude that there is a moderate risk of bias since insufficient information documented to say low risk.
Gansky & Plesh 2007	low	Sample stated to be representative of the target population, cohort has high retention rate. However, unlikely to be representative of the general population as a whole, since limited population in terms of age, gender and race.
Guermazi et al. 2008	moderate	Sample selected from one city, which while in the opinion of the authors was felt to be representative of the general population of Tunisia, there was no objective measure of. No response rate is given and no description of non responders is provided. There was no general population data available on which to base the proportion selected for inclusion. Unclear sampling frame, no register/list of residents given as source of sample. Therefore must conclude at least a moderate risk of selection bias.
Hagen et al. 2005	moderate	Responders in this study need to have responded to two postal surveys (over a decade apart) and completed 2 questionnaires in the second survey, there is therefore likely to be bias due to loss to follow up. However, the study has large sample size. Information in other publications may have compared responders to non-responders, however, the information is not provided in this paper, so must conclude at least a moderate risk of bias.
Haq et al. 2005	moderate	While the study has high response rates, there is no description provided of non-responders, so unable to judge if non-response may have lead to bias. In addition no comparison is made between study populations (rural, urban slum, urban affluent) and the rest of the Bangladeshi population to judge how representative these populations are of the Bangladeshi population as a whole. Study is very likely to provide a fair measure of prevalence in sampling frame, but unclear if this can be extrapolated to the country as a whole.

Study	Risk of bias	Rating Justification
Hardt et al. 2008	moderate	The cohort from which the large sample is drawn is stated to be representative of the US general population with an oversampling of ethnic minorities. This is accounted for in analysis by standardising the figures to the US population. This would seem a reasonable approach to take, however, no evidence is provided regarding the representativeness of the study sample, neither are response rates or recruitment strategies documented, it is assumed that these are provided in the publications referenced in the paper, however, since sample is stated to oversample ethnic minorities it cannot be taken to be representative of the whole population. There is also a lack of documentation regarding what constitutes a 'personal' interview, if this is conducted by phone it may systematically systematically exclude individuals without a phone.
Häuser et al. 2009b	low	While response rate is low and no description is provided of non-responders, the sample is stated to be representative of the German population based on statistics from German Federal Statistics for 2007 with respect to age, gender, and educational qualifications.
Häuser et al. 2013	low	While response rate is low (56%), reasons for non-participation are given and while the sample is stated to differ from the general population on age and gender distribution and education it is not significantly different from the general population.
Hughes et al. 2006	low	This study uses the GPRD (General Practice Research Database) which contains the medical records from more than 350 general practices in the UK, and represents approximately 4.6% of the UK population. Since it is estimated that 95% of the UK population are registered with a GP this data offers a good representation of the UK population.
Hunt et al. 1999	low	Sample selected randomly, reasonable response rate, description of responders provided and comparison of figures derived from sample against figure standardised to the UK general population show little difference, there is no evidence that any differences in the study sample will influence the outcome.
Jacobsson et al.1996	moderate	No documented details are given regarding sample selection, recruitment methods, response rate, non-responders or baseline study population (with the exception of gender and diabetic status). No comparison is made to the target population. Must therefore conclude at least a moderate risk of selection bias, since insufficient information to make the judgement.
Joshi & Chopra 2009	moderate	Insufficient documentation regarding: sample selection, recruitment approach and response rate. However, comparison is made between study sample and Indian general population in terms of age distribution. Study sample found to be older than general population, prevalence figures standardised by age and gender to Indian 2001 census population.
Kim et al. 2006	high	Non-random voluntary recruitment is highly likely to lead to participation bias.This is supported by the observation that 66% of the sample are female, this is unlikely to be representative of the underlying population. Response rate is not applicable since participants were recruited by voluntary response to a mass health screening.
Klemp et al. 2002	high	Non-random recruitment by tribal elders of tribal constituent of the study, while necessary due to cultural beliefs, will nonetheless lead to bias. Effort has been made to counter this by adjusting figures for age (would result in a moderate risk of bias), however, in addition, the study had very poor response rates and there was no analysis of non-responders and no comparison made with target population, must therefore conclude a high risk of participation bias.
Kurita et al. 2012	moderate	Moderate response rate of 61%. No description of non-responders is provided and there is no comparison of the sample to the target population, therefore we are unable to judge whether the sample is representative of the target population, however, the results are adjusted for non-response using weighting based on information available in the Danish Civil Register (sex, age, residence, education level, income, employment status, country of origin and health care utilisation), so this may not be a problem.
Lindell et al. 2000	high	While response rate is reasonable, and sample selection would seem to be fair, there seems to be a problem with response-bias: non-participants are shown to be different to participants with respect to the outcome measure (non-responders shown to be less likely to complain of chronic pain). No comparison is made to target population. Study only examines a stratified sample of positive responders.

Study	Risk of bias	Rating Justification
Macfarlane et al. 2005 (survey A)	moderate	Using GP registered population to reflect general population of the UK is valid due to high proportion of individuals registered with a GP in the UK, however, GP practices were chosen for high density of South Asian population, therefore unlikely to represent the general population of the UK. Response rates are relatively poor. Comparison of age/gender distribution in the two study groups demonstrate that samples not similar, therefore also unlikely to be representative of the underlying population. However, prevalence figures standardised for age and gender.
Macfarlane et al. 2005 (survey B)	moderate	Sample taken from GP register, which is a valid approach in the UK. However, there is insufficient documentation regarding sample selection/response rate/ baseline study population/non-responders provided to judge risk of selection bias. Must therefore conclude at least moderate risk of bias, possibly high risk given low sample size and use of only one geographical area to recruit participants from.
Macfarlane et al. 2009a	low	Clear documented details (in another publication) showing that sample broadly representative of surviving cohort. However, only representative of those age 45yrs.
Macfarlane et al. 2009b	low	Sample selected using stratified sampling from appropriate population registers, low participation rates in some centres may be a concern, but prevalence not observed to be related to participation rate, so it was concluded that decision not to participate was not importantly influenced by CWP.
Mäkelä & Heliövaara 1991	low	While no detail is given regarding how sample selected, it is stated to be representative of the Finnish population, and has a high response rate. However, prevalence calculated after examination of screen positives only, therefore moderate risk of bias as a result of possibly missing some individuals who were not examined.
Marschall et al. 2011	high	Sample includes only one insurance provider. Does not include AOK which is the largest of Germany's roughly 180 statutory health insurance funds and does not include private insurance funds.
McNally et al. 2006	low	This a large size survey with a sample selected to be representative. Mandatory completion ensured complete response rate. Sample stated to be representative of the general population of Canada.
Minaur et al. 2004	moderate	The study had a good response rate (80%) and the study sample seems comparable with 2001 census data for the region in terms of age and gender, however, no description is provided regarding sample selection and recruitment methods and there is no discussion of how representative the Aboriginal population in this region is of the Aboriginal population in the rest of Australia. No description is provided on non-responders. Therefore must conclude a moderate risk of selection bias.
Øverland et al. 2012	high	There is insufficient information about non-responders and no comparison of responders to the baseline population, so we are unable to judge whether the sample is representative of the general population and a limited age range (40–46) is unlikely to be representative.
Papageorgiou et al. 2002	low	Reasonable response rate and sample selected randomly from GP register which is felt to be representative of the general population in the UK, however, need to be careful with generalising this prevalence to the population as a whole, since only used one general practice in Handford.
Pelaez-Ballestas et al. 2011	low	Sample selected using random sampling techniques, subjects recruited at times they were likely to be home, up to 4 repeat visits to a household to ensure participation. However, some regions have very poor response rates and baseline study population shown to be have high density of women. While methods of sampling should ensure a random sample, participation bias may be a problem as indicated by poor response rates in some regions and baseline study population being different to underlying general population. However, perhaps large sample size may account for this therefore low risk of bias.
Perrot et al. 2011	high	There are low response rates to both screening interview (51%) and follow up physical examination of screen positives (41%). There is no information provided comparing responders to the target population or to non-responders to judge the effect of the low response rate. Identifying patients from the telephone directory systematically excludes those without a telephone and those not included in the telephone directory. These individuals are likely to be systematically different to those in the sampling frame. There is no statement made regarding the time of day calls were made, if calls were only made during the day this would systematically exclude daytime workers. Finally, prevalence estimates were extrapolated from FM rates observed in screen positives attending for physical examination.

Study	Risk of bias	Rating Justification
Picavet & Hazes 2003	moderate	Sample selected via stratified sampling from 1998 population census, which is a reasonable approach, however, low response rate of 47% leading to a sample with higher proportions of women, middle aged and married people, therefore likely to be at least a moderate risk of selection bias.
Prescott et al. 1993	low	Study sample drawn from the responders to another survey. The sampling frame is shown to be representative of the target population and the study sample shown to be representative of the sampling frame with respect to age and gender (study participants more likely to be married and live in a rural area). However, response rate is reasonable, therefore there is evidence that participation is not likely to be related to outcome.
Raspe & Baumgartner 1993	high	The sample is selected randomly, there is a reasonable response rate of 81% to the initial postal questionnaire and a reasonable response of 76% to examination, however, there is no evidence provided that the sample is representative of the target population and no information is provided regarding non-responders to both the questionnaire and examination phase. Must therefore conclude at least a moderate risk of sample selection bias, however, the assumptions that have been made in the estimation of population parameters mean this study must be rated at high risk of bias. The assumptions made in the calculation of prevalence are very likely to result in inaccurate estimates. It is not appropriate to assume that non-responders are the same to responders, cannot therefore assume that there is an equal frequency of widespread pain in non-responders, cannot therefore extrapolate anything regarding FM prevalence among those who have not responded.
Reyes-Llerena et al. 2000	high	Sample selected non-randomly and stated to have an over representation of individuals of Caucasian and African origin. No clear documentation of sample selection and recruitment. 100% response rate seems unrealistic and therefore suspicious. Have to conclude a high risk of bias.
Reyes-Llerena et al. 2009	low	Sample selected randomly from an area which is stated to be representative of the general population of Cuba. While no response rate is provided and no description is given of non-responders, sociodemographic data for the sample is provided and the age distribution of the sample is compared with that of the national population derived from a recent national census.
Rodriquez-Amado et al. 2011	low	Sample selected using stratified sampling from national census data, 94% response rate, details of baseline study population provided.
Salaffi et al. 2005	low	The sample was selected using random stratified sampling, however, GPs were given the power to veto some selections, most of these decisions seem reasonable (e.g. died, no longer register, dementia, etc) however, there are 99 patients excluded by GPs with no reason given, it's unclear if these patients were systematically different from others. Description of baseline study population provided and non-responders were investigated, so while there is a question regarding the 99 patient excluded, the study sample would seem representative of the target population, at least with respect to age and gender.
Santos et al. 2010	moderate	Sampling frame likely to be representative (no statement given in this paper, references to another 2 publications). Good response rate, baseline study sample described. Non-responders unlikely to be a problem due to high response rate. Moderate risk of bias as a result of exclusion criteria, excluding individuals on antidepressants, analgesics or anti-inflammatories (regularly used treatment medication for CWP/FM) likely to systematically exclude those with FM/CWP, also excluding those with other rheumatic disease will exclude patients who also have FM/CWP. Study likely to be an underestimation of population prevalence.
Sauer et al. 2011	high	Sample includes only one insurance provider. Does not include AOK which is the largest of Germany's roughly 180 statutory health insurance funds and does not include private insurance funds.
Schochat & Raspe 2003	moderate	Participants recruited from all women aged 35–74 on the state register in one area in Germany, there is a reasonable response rate of 74%. There is no evidence provided that this area is representative of the German population (this is a very select population, in terms of age, gender and location), no information is provided regarding non-responders and no description of the baseline study population is offered or comparison made with the target population, must therefore conclude a least a moderate risk of participation bias.

Study	Risk of bias	Rating Justification
Scudds et al 2006	moderate	Sample selected randomly from telephone directory, with reasonable response rate of 60%. Sample stated to be representative of Hong Kong census in terms of age. No other comparisons offered. No information provided regarding non-responders. Low response rate to examination phase also a problem. Sampling frame excludes those without a telephone and those who have chosen not to have their numbers in the telephone directory, therefore likely to lead to a systematically different set of individuals in the sample.
Senna et al. 2004	moderate	The sample was selected using cluster sampling, there was a high response rate to both the interview phase and the examination phase. There is a possibility that since all subjects were not examined there might be an underestimation of prevalence. The baseline study population is described and the sample is compared to the sociodemographics of the target population. No description is provided of non-responders. This study must be considered moderate risk of participation bias, since it is unclear how representative the Montes Claros region is of urban Brazil as a whole.
Storozhenko et al. 2004	moderate	Good response rate of 76% and the age and gender distribution of the sample is provided however, no statement is made regarding whether Yekaterinburg is representative of the general population of Russian and no comparison made with target population and no description of non-responders provided.
Svebak et al. 2006	low	All residents of one region were invited to participate, there was a 70% response rate. Participants are more likely to be female and aged 60–69. Non responders were described. Prevalence figures were standardised for age and gender.
Topbas et al. 2005	low	High response rate from a sample selected randomly from health care registration records. Only reservations I have are how many of the Turkish population are registered with a GP? (are these registration records representative of the general population?) and how generalisable is the population of Trabzon to the rest of Turkey?
Turhanoglu et al. 2008	low	Sample selected to represent Turkish population, baseline sample described, complete response rate for screening phase. However, no response rate quoted for examination phase.
Veerapan et al. 2007	high	Unclear description of recruitment process, inadequate description by which to judge bias, this would result in a moderate risk of bias, however the paper itself describes the difficulty in finding one community which represents the multiethnic population of Malaysia – therefore would seem very unlikely that in recruiting the sample from one suburb that it will be representative of the general population.
Vincent et al. 2013 (medical records)	low	This study uses the medical records of all those registered with the Rochester Epidemiology Project, which has been shown to capture 'virtually the entire' target population.
Vincent et al. 2013 (self report)	high	While the sampling frame and random selection of study sample appears appropriate, the very low overall response rate (28%) and particularly low response rate in the 21–39 year age group (16%) suggests that the sample is unlikely to be representative of the target population. In addition, no details comparing responders with non-responders or responders and the target population are provided to help assess how much the poor response rate might have influenced the prevalence estimate. In addition an unexpectedly high prevalence rate in the 21–39 year age group suggests that prevalence estimates may be biased.
White et al. 1999	moderate	Sample shown to be different to census data, while figures are standardised against census data, this does not remove possible systematic bias as a result of telephone interviewing (excludes those without a home phone).
White et al. 2003	low (Amish) moderate (non-Amish)	Amish arm of study low risk of selection bias due to 74% participation by those eligible to participate. Amish community in Aylmer likely to be representative of other Canadian Amish. Non-Amish rural arm of study moderate risk of selection bias due to telephone recruitment of participants excluding those without a telephone and those not in at the time of a call, no information about non-responders, and figure for FM likely to be biased due to low participation rate for examination arm of study (42%)
Wolfe et al. 1995	moderate	While the study samples the general population of Wichita city, with a good response rate of 86% for questionnaire and a reasonable response of 61% to the examination phase, it is not clear how representative Wichita city is of the general population in the US, must therefore conclude a moderate risk of selection bias.

Study	Risk of bias	Rating Justification
Wolfe et al. 2013	low	While response rate is low (56.7%), details of non-participants are provided and the study sample is demonstrated to be comparable to the target population on age and gender.
Zapata et al. 2006	high	Only private school students in one city investigated. No clear age of participants given. Only a subset of participants examined. Select group of participants and low response rate.
Zeng et al. 2010	moderate	No detail is provided of sampling frame or sampling strategy by which to judge possibility of selection bias, must therefore conclude at least a moderate risk of bias

A3.5 Methodological quality: justification of ratings for QUIPS tool domain 4

Table A3.7 Risk of outcome measurement bias and justification for rating using domain 4 of the QUIPS methodological quality assessment tool.

Study	Risk of bias	Rating Justification
Ablin et al. 2012	high	Used positive predictive value (PPV) ascertained from a different population to that under investigation to calculate prevalence. Therefore unlikely to be a reliable measure of prevalence. Also no statement made regarding validation of examination used in the rheumatology outpatients department to determine FM status and therefore calculate the PPV used to calculate community prevalence.
Abusdal et al. 1997a	moderate	Measurement of the outcome is similar for all subjects. However, unclear documentation regarding case definition and unclear if testing of retest reliability of questionnaire is done appropriately.
Aggarwal et al. 2006	low	Measurement of outcome is valid, reliable and similar for all subjects. Might be some underestimation of ACR-90 CWP status due to exclusion of head pain from case criteria, however, likely to be small.
Alvarez-Nemegyei et al. 2005	moderate	Insufficient information to determine whether outcome measurement is valid and reliable, since no reported evidence of questionnaire validation, or reliability of junior doctors' diagnosis. Method and setting of outcome measurement not similar for all subjects. Prevalence estimates based on extrapolation from figures observed in screen positives only.
Alvarez-Nemegyei et al. 2011	moderate	While screening questionnaire has been validated there is no documentation regarding any efforts taken to ensure that those administering the questionnaire are doing so reliably. Only screen positive are examined. Unclear if measurement of outcome is valid as no information given regarding test-retest reliability of physicians conducting examination.
Andersson 1994	moderate	CWP: Moderate risk of bias as clear diagnostic criteria stated, measured using a validated instrument in a similar setting for all participants, however diagnostic criteria are not accepted CWP criteria. FM: Moderate risk of bias as no clear diagnostic criteria stated, no stated measures taken to ensure validity/reliability of diagnosis. Only examined a sub-sample of CWP positive responders.
Andersson et al. 1999	high	Coding: Low Community: High due to variation in diagnostic and coding practices among clinicians and variation in consulting behaviour between patients, therefore prevalence estimate will likely underestimate community prevalence
Assumpção et al. 2009	moderate	Clear operationalisation of outcome measure but unclear validation of examination/diagnosis and not all participants examined. Insufficient information about screening questionnaire to judge validity.
Bazelmans et al. 1999	high	Coding: High. No clear, constant diagnostic approach taken between clinicians. Paper doesn't state FM diagnostic criteria. Community: High. Relies on the clinicians diagnostic beliefs and the patients consulting behaviour.
Bergman et al. 2001	low	Measurement of outcome is similar for all subjects. While the questionnaire is not validated is uses a standard approach to assessing self-reported CWP status which has been used by other studies (i.e. question regarding pain duration and body mannikin to locate pain).
Branco et al. 2010	high	Uses positive predictive value (PPV) ascertained from a different population to that under investigation to calculate prevalence, this is unlikely to lead to a reliable prevalence estimate. Also no statement made regarding validation of examination used in the rheumatology outpatient department to determine FM status and therefore calculate the PPV used to calculate prevalence.
Buskila et al. 1993	moderate	Method and setting of measurement is standard for all subjects using standard approach, however, no evidence is provided of reliability of outcome measurement. No statement is made regarding test-retest reliability of interview/ examination.
Buskila et al. 2000	low	Outcome measurement conducted in a similar way for all participants using an accepted approach to measurement and using clearly documented case criteria.
Cakirbay et al. 2006	high	Screening questionnaire not validated. No steps taken to validate examination or blind examiners to screening status. No statement given regarding method or setting of screening questionnaire or follow-up examination. Examination of only screen positives may lead to bias. Insufficient information given to judge risk of bias in measurement of outcome measure, therefore must conclude high risk of bias.
Cardiel & Serrano 2002	moderate	While all subjects were screened in a consistent manner using a validated instrument, not all subjects were examined, and little evidence is provided for validity/reliability of clinical examination.

Study	Risk of bias	Rating Justification
Carmona et al. 2001	low	Use of previously validated instruments which have been pilot tested. Data collectors instructed in standard interview/examination protocol prior to study. Data collection monitored during the study for consistency. Similar method and setting of outcome measurement for all participants.
Carnes et al. 2007	low	Measure of outcome similar for all subjects, criteria are clearly stated and while the questionnaire is unvalidated it uses a standard approach to assessing pain location using a blank body manikin. However, there is no detail provided regarding how chronicity of pain was elicited, it is assumed that patients were asked a simple question about pain duration given the use of the chronic pain grade scale.
Chaaya et al. 2012	moderate	We must conclude at least a moderate risk of outcome measurement bias because no information is provided regarding and measures taken to ensure the reliability of the interview, and no information is given regarding whether the examination was standardised or tested for reliability.
Chen et al. 2008	high	Poor operationalisation of ACR-90 criteria using a questionnaire only. Study uses two questionnaires which have not been validated as a means of determining FM prevalence without an associated examination. High likelihood of overestimation of prevalence.
Choudhury et al. 2013 (long)	moderate	While the questionnaire uses a standard method of ascertaining CWP status (body mannikin) and the setting is the same for all participants, there is no statement regarding the interview validity and it is unclear how much a possible lack of confidentiality in the interview setting (GPs waiting rooms) might have influenced participants responses.
Choudhury et al. 2013 (short)	low	Measure of outcome similar for all subjects (although some were assessed with postal questionnaire, late responders were assessed using a telephone questionnaire), criteria are clearly stated and while the questionnaire is unvalidated it uses a standard approach to assessing pain location using a blank body manikin.
Clark et al. 1998	low	While the questionnaire used is not validated is uses a standard approach used by other studies. Screening process unlikely to have excluded individuals with FM, therefore examination of only screen positives unlikely to be a problem. Examiners not blinded to screening status, but examinations conducted in a systematic way.
Croft et al. 1993	low	Clear operationalisation of CWP criteria, use of a study specific questionnaire that while not stated to have been validated or tested for reproducibility, uses a standard approach to assessing CWP. Measurement of outcome is similar for all subjects.
Dans et al. 1997	low	Measurement of outcome is similar for all subjects, clear diagnostic criteria given, clinicians given standardised training in diagnosis prior to study.
Davatchi et al. 2008	high	The study uses a validated and back translated questionnaire that has been pilot tested, the interviews are conducted by trained interviewers, and test for reliability with frequent quality control, however, the examination is not validated, adequately described or tested for reproducibility and diagnosis is based on 'clinical judgement' and therefore not a robust measure.
Davatchi et al. 2009a	moderate	While questionnaires and interviews appear to be valid and tested for reliability. Examination has not been validated or tested for reproducibility and while diagnostic criteria are given (WHO-ILAR criteria, assume this means ACR-90) diagnosis is based on 'expert opinion'.
Eggermont et al. 2010	low	Clearly defined outcome measures, recorded in a standardised fashion. Possibility that case definition may not accurately represent ACR-90 criteria, however case definition criteria are given sufficiently that it offers a useful figure to compare with prevalence figures derived using alternative criteria.
Elstad 1994	high	Case definition based on patient recollection of physician diagnosis. This relies on patient recall and understanding, physician communication, physician's diagnostic practices and beliefs. There are too many other variables contributing to definition of a 'case' to provide an accurate measure of FM diagnosis in the community. In addition there is no statement made regarding the reliability/ validity of the questionnaire.
Farooqi & Gibson 1998	moderate	Insufficient information regarding examination procedure, validity and reliability and no statement of diagnostic criteria.
Forseth & Gran 1992	high	Unreliability of unvalidated clinical judgement of one clinician only and unvalidated postal questionnaire used to determine positive responders. Random sample of positive responders selected for follow-up examination. Not robust to extrapolate the prevalence found in random sample of screen positives to the population as a whole.
Gansky & Plesh 2007	low	Measurement of outcome is valid, reliable and similar for all subjects.

Study	Risk of bias	Rating Justification
Guermazi et al. 2008	moderate	The study uses a previously validated questionnaire that has been translated and back translated and then tested in a pilot of 30 subjects. However, the examination procedure is not documented and there is no statement made regarding any reliability testing of the examination process, therefore must conclude at least a moderate risk of outcome measurement bias.
Hagen et al. 2005	moderate	Measure of outcome similar for all subjects, but questionnaire unvalidated and while criteria are clearly stated, there is a question about the validity of the case definition.
Haq et al. 2005	low	Measurement of outcome is similar for all subjects. Interviewers and examiners trained for standard application of interview/examination. Review of all questionnaires and examination sheets by rheumatologists ensures reliability of diagnosis. Only worry would be that tender point examination might not have been carried out appropriately since no documentation, however, training of examiners should ensure that this is carried out according to standard protocols.
Hardt et al. 2008	moderate	Due to insufficient documentation of interview process and validity/reliability of questionnaire unable to give this study a low risk of outcome measurement bias and must conclude a moderate risk of bias.
Häuser et al. 2009b	high	Non-standard criteria for FM based on self-report only with no examination, however, questionnaire stated to have good concordance with FM diagnosis in a rheumatology clinic.
Häuser et al. 2013	low	Validated measure of outcome used, applied in a consistent method to all participants.
Hughes et al. 2006	high	Community prevalence: High risk of bias since coding prevalence will be influenced by consulting behaviour and diagnostic beliefs of clinician. Coding prevalence: Low risk of bias.
Hunt et al. 1999	low	Measurement of outcome is similar for all subjects, it uses a standard approach and the coder of manikins is blinded to patient's psychosocial status.
Jacobsson et al. 1996	moderate	The operationalisation of the outcome measure is reasonable, but no statement is made regarding any validity/reliability testing of the questionnaire/interview process, must therefore conclude moderate risk of outcome measurement bias.
Joshi & Chopra 2009	moderate	Study uses a widely used and pre-validated questionnaire. The questionnaire is administered by personnel trained over two days (therefore assume good inter-rater reliability). Concern over use of screening question to determine questionnaire administration, since this is not used in other studies using COPCORD questionnaire, however, unlikely to exclude cases, so probably valid. No documentation regarding examination procedure or steps taken to ensure reliability/validity of examination process so must therefore conclude a moderate risk of bias.
Kim et al. 2006	moderate	Clear case criteria have been used, but there is insufficient documentation regarding the reliability of the screening questionnaire and setting of outcome measurement to infer low risk of bias. There is also inadequate documentation regarding testing for reliability of interviewers and examinations, so must conclude at least moderate risk of bias.
Klemp et al. 2002	moderate	While there is clear documentation of the examination procedure and the examination process is shown to be reliable and reproducible by pre-study standardisation, there is no documentation regarding the validity/reliability of the interview procedure to ascertain CWP status, must therefore conclude a moderate risk of outcome measurement bias.
Kurita et al. 2012	moderate	While the outcome is defined as pain in 4 or more sites lasting 6 months or longer, this is a non-standard definition for CWP and it is unclear how the number of body sites were measured (no information about whether the study used a body mannikin, a list of body regions or the free text of the respondents).
Lindell et al. 2000	high	Long delay between questionnaire and examination, may have resulted in resolution of symptoms for some subjects leading to underestimation of prevalence. In addition only examining a stratified sample of screen positives and extrapolating to the rest of the population is not robust.
Macfarlane et al. 2005 (survey A)	low	Measurement of outcome is similar for all subjects, while study makes no statement regarding validity/reliability of questionnaire, it uses a standard approach to assessing CWP.
Macfarlane et al. 2005 (survey B)	low	Measurement is similar for all subjects. While there is no statement regarding questionnaire validity it uses a standard approach to assessing the outcome, so unlikely to lead to systematic bias.
Macfarlane et al. 2009a	low	Clear case definition, outcome measured in a standardised way, no statement made regarding validity of questionnaire, however takes a standard approach (question about pain duration and blank body manikin to record location of pain).

Study	Risk of bias	Rating Justification
Macfarlane et al. 2009b	low	Measurement of outcome is valid (standard approach) and similar for all subjects.
Mäkelä & Heliövaara 1991	high	Examination not designed to test for FM therefore tender points not tested for using accepted methodology, therefore likely to underestimate prevalence. In addition only screen positives examined.
Marschall et al. 2011	high	Community prevalence: High risk of bias since coding prevalence will be influenced by consulting behaviour and diagnostic beliefs of clinician. Coding prevalence: Low risk of bias, particularly since it requires the recording of the FM code twice in the medical records.
McNally et al. 2006	high	Relying on patient recall of physician diagnosis is not an accurate assessment of community prevalence of a disease since it relies on: patent recall, consulting behaviour, diagnostic beliefs of clinician, communication between clinician and patient. Highly likely to be an under representation of prevalence.
Minaur et al. 2004	moderate	While a widely used and validated screening tool is used, there is no statement made regarding the reliability of the interview process and the examination procedure, must therefore conclude at least a moderate risk of outcome measurement bias.
Øverland et al. 2012	moderate	The same method of assessment is used for all participants and the outcome is clearly defined, however, case definition for CWP is non-standard since it makes no assessment of contralateral limb pain and no statement is made regarding any efforts to validate the questionnaire.
Papageorgiou et al. 2002	low	The study uses a stand method of outcome measurement and is similar for all subjects.
Pelaez-Ballestas et al. 2011	moderate	The study clearly defines diagnostic criteria and outcome measurement is similar for all subjects, however, only screen positives are examined. The COPCORD questionnaire has been used in many other studies and is validated. However, no description is provided regarding the reliability of the interview/examination process. Must therefore conclude a moderate risk of bias due to inadequate reporting of data collection.
Perrot et al. 2011	moderate	While the study uses a screening questionnaire that has been widely used and validated in other studies, no statement is made regarding any efforts to standardise its administration. Further, only those screen positives who accepted were examined. We must conclude therefore that there is at least a moderate risk of outcome measurement bias.
Picavet & Hazes 2003	high	Relying on self reported diagnosis of FM is not an accurate assessment of community prevalence of a disease since it relies on: patent recall, consulting behaviour, diagnostic beliefs of clinician, communication between clinician and patient, patient self diagnosis. Highly unlikely to be an accurate representation of community prevalence.
Prescott et al. 1993	low	Measurement of outcome is valid and reliable – uses clear diagnostic criteria and 2 examiners independently examining all screen positives. The examination of only screen positives is unlikely to exclude any patients with FM.
Raspe & Baumgartner 1993	high	Definition of outcome not adequately documented. Unclear if questionnaire is capable of picking up all subjects with CWP, therefore only examining those that are defined as having multi location chronic pain according to the questionnaire may miss relevant patients. Examination is well documented, with the exception of the location of the control points.
Reyes-Llerena et al. 2000	high	While the study uses a widely used and validated screening questionnaire, the interview and examination process are not documented and no clear diagnostic criteria are provided, it is unlikely therefore that the results of the study are reproducible.
Reyes-Llerena et al. 2009	moderate	While the study uses clearly defined diagnostic criteria and a validated and widely used questionnaire, the paper itself suggests the possibility of a low index of suspicion for FM by the interviewers, leading to examinations that did not specifically look for tender points and might therefore have missed FM diagnosis, possibly underestimating FM prevalence, must therefore conclude at least a moderate risk of measurement bias.
Rodriquez-Amado et al. 2011	low	Cases are defined using standard criteria. Screening unlikely to exclude cases (uses widely used and validated instrument), potential cases all reviewed by a rheumatologist.
Salaffi et al. 2005	moderate	While the study uses accepted and clear case criteria, and a similar method of outcome measurement for all subjects, no statement is made regarding the validity/reliability of questionnaire, interview or examination. The reliability of the screening questionnaire is unclear, therefore unable to judge whether any subjects could have been missed by the screening questionnaire. Unable to judge reliability/validity of diagnosis and must therefore conclude a moderate risk of outcome measurement bias.

Study	Risk of bias	Rating Justification
Santos et al. 2010	moderate	While case criteria and examination procedures are clearly documented, there is insufficient documentation to judge the validity of the screening questionnaire used to determine whether a participant is examined or not. Must therefore conclude at least a moderate risk of outcome measurement bias.
Sauer et al. 2011	high	Community prevalence: High risk of bias since coding prevalence will be influenced by consulting behaviour and diagnostic beliefs of clinician. Coding prevalence: Low risk of bias.
Schochat & Raspe 2003	low	Outcome measurement is similar and uses a standard approach (question about pain duration and blank body manikins to capture pain location) for all subjects.
Scudds et al 2006	low	The study uses clearly defined case definition criteria and uses a back translated version of a validated instrument to screen participants for CWP. Interviews are standardised and examination protocol clearly documented.
Senna et al. 2004	moderate	While the COPCORD screening questionnaire is validated and has been widely used, there is insufficient documentation regarding the reliability of the interview and examination processes, must therefore conclude at least a moderate risk of outcome measurement bias.
Storozhenko et al. 2004	low	Method and setting of outcome measurement similar for all respondents. Questionnaire based on validated questionnaires. Russian and English speakers translated and back translated from a validated questionnaire.
Svebak et al. 2006	moderate	Definition of CWP is non standard, the questionnaire has not been validated for determining estimates of widespread pain, must therefore conclude a moderate risk of outcome measurement bias.
Topbas et al. 2005	low	Screening test uses a validated questionnaire which has been used in other studies. Examination is conducted according to a clearly documented protocol.
Turhanoglu et al. 2008	moderate	Measurement of outcome is similar for all subjects and uses standard case definition criteria, however no statement is made regarding the reliability/validity of the questionnaire, interview or examination process, must therefore conclude at least a moderate risk of bias.
Veerapan et al. 2007	high	While the study uses the pre-validated and widely used COPCORD tool, it is unclear if the administrators of the tool were adequately trained to use it, and there is no statement made regarding the examination procedure used or any measures taken to check for reliability of examination procedure. This would result in only a moderate risk of bias, however, in addition, no statement has been made regarding diagnostic criteria used for case determination, this study must therefore be considered at high risk of outcome measurement bias since it is unclear if robust case definitions are used and unclear if interview and examination valid and reliable. In addition only those with pain in "the last week" were examined, therefore potential to exclude FM patients who were currently pain free.
Vincent et al. 2013 (medical records)	high	Coding prevalence: low risk of bias. The means of identifying diagnosed FM through medical record review is unlikely have missed cases. Community prevalence: high risk of bias since medical record review will only capture those who consult for symptoms and those that the clinician diagnoses as having FM.
Vincent et al. 2013 (self report)	low	The study uses a new, but clearly documented, classification criteria for FM. FM status is assessed using a questionnaire whose development is clearly documented in another paper. The same method and setting of outcome measurement is used for all participants.
White et al. 1999	low	Study uses validated questionnaire, interviews are quality controlled and examination is clearly documented and consensus between examiners checked.
White et al. 2003	moderate	There is insufficient documentation regarding the reliability of the examination phase of the study, must therefore conclude at least a moderate risk of outcome measurement bias.
Wolfe et al. 1995	low	Questionnaire used is not validated but uses a standard approach, examination is standardised and clearly documented.
Wolfe et al. 2013	low	The study uses a new, but clearly documented, classification criteria for FM. FM status is assessed using a questionnaire whose development is clearly documented in another paper. The same method and setting of outcome measurement is used for all participants. The only criticism might be that the new criteria do not measure FM prevalence, however, with no gold standard measurement for FM, and with the new criteria aiming to better capture the continuum of the FM experience, it might be argued that these criteria better identify FM patients, in addition figures are given for how many cases meet established ACR-90 criteria (82.7% overall).
Zapata et al. 2006	moderate	Clear outcome criteria measured in a consistent manner, however, no statement regarding validation of questionnaire or examination, therefore must conclude at least a moderate risk of bias.

Study	Risk of bias	Rating Justification
Zeng et al. 2010	moderate	Study makes uses of validated and widely used COPCORD screening questionnaire and examination of suspected cases was undertaken by 3 rheumatologists to ensure consensus, however, no statement is made regarding the validity/reliability of the screening interview, must therefore conclude a least a moderate risk of outcome measurement bias.

A3.6 Summary of included studies

Table A3.8 Summary of studies included in the systematic review, including: sample size, age and sex, geographical location of the study, diagnostic criteria, and prevalence estimates.

Study population	Study	Sample size	Sample Age	Location	Diagnostic criteria	FM	CWP
Children, adolescents & young adults	Buskila et al. 1993	338	9–15	Israel	ACR-90 – including tender point examination	620 (410, 930)*	
	Clark et al. 1998	548	9–15	Mexico	ACR-90 – including tender point examination	120 (60, 260)*	
	Zapata et al. 2006	359	adolescent	São Paulo, Brazil	ACR-90 – including tender point examination	100 (20, 130)*	
Female adults	Abusdal et al. 1997a	2,622	25–55	Norway	Generalised pain for 3 months or longer with everyday life influenced by a great extent.		290 (230, 350)
	Cakirbay et al. 2006	1,045	18–55	Trabzon City, Turkey – urban	ACR-90 – including tender point examination	680 (540, 850)*	
	Elstad 1994	3,211	36–55	Norway	Self-reported recall of diagnosis	440 (370, 520)*	
	Forseth & Gran 1992	2,038	20–49	Arendal, Norway	ACR-90 – including tender point examination	1,050 (640, 1,460)	
	Gansky & Plesh 2007	1,334	21–26	USA	ACR-90 – including tender point examination	240 (170, 350)	560 (440, 690)*
	African American	684				300 (200, 460)	
	Caucasian	650				200 (120, 340)*	
	Macfarlane et al. 2005 (survey B)		18–36	UK	ACR-90 CWP criteria		
	South Asian	137					940 (560, 1560)*
	White European	121					570 (280, 1150)*
	Schochat & Raspe 2003	2,253	35–74	Germany	ACR-90 – including tender point examination		1350 (1210, 1500)*
	Topbas et al. 2005	1,930	20–64	Turkey	ACR-90 – including tender point examination	360 (280, 440)*	

Study population	Study	Sample size	Sample Age	Location	Diagnostic criteria	FM	CWP
Male adults	Macfarlane et al. 2009b	3,963	40–79	8 European countries	ACR-90 CWP criteria		830 (750, 930)
	Belgium (Leuven)	452		Belgium (Leuven)			690 (490, 960)*
	England (Manchester)	590		England (Manchester)			520 (360, 730)*
	Estonia (Tartu)	527		Estonia (Tartu)			1530 (1230, 1870)*
	Hungary (Szeged)	431		Hungary (Szeged)			1040 (780, 1380)*
	Italy (Florence)	484		Italy (Florence)			460 (300, 690)*
	Poland (Lodz)	408		Poland (Lodz)			900 (650, 1220)*
	Spain (Santiago)	548		Spain (Santiago)			870 (660, 1140)*
	Sweden (Malmo)	523		Sweden (Malmo)			700 (510, 960)*
Older adults	Eggermont et al. 2010	585	70+	Boston, USA	FM: ACR-90 – including tenderpoint examination. CWP: Using McGill pain questionnaire or positive response to the Q "during the past year have you had pain, aching or discomfort all over for 3 months or longer?"	30 (10, 123)*	910 (700, 1,070)*
	Santos et al. 2010	361	65+	Brazil	ACR-90 – including tender point examination	550 (540, 570)	1,410 (1,050, 1,770)
Birth cohorts (mixed gender)	Macfarlane et al. 2009a (1958 British Birth Cohort)	9,377	45	UK	ACR-90 CWP criteria		1,180 (1,120, 1,250)*
	Øverland et al. 2012 (1953–1957 Birth Cohort: Hordaland Health Study)	17,706	40–46	Norway	Pain lasting 3 months or longer in trunk, lower limbs and upper limbs. No assessment of contralateral body pain.		1,240 (1,193, 1,290)*
Male & female adults	Ablin et al. 2012	1,019	18+	Israel	Based on ACR-90 criteria, no examination conducted	200 (130, 270)	510 (391, 663)*
	Aggarwal et al. 2006	2,299	18–75	Manchester, UK	ACR-90 CWP criteria		1,500 (1,367, 1,647)*
	Alvarez-Nemegyei et al. 2005	761	18+	Cantamayec, Yucatán, Mexico	ACR-90 – including tender point examination	130 (60, 240)	
	Alvarez-Nemegyei et al. 2011	3,195	adults	Yucatan, Mexico	ACR-90 – including tender point examination	20 (10, 40)	
	Andersson 1994	1,609	25–74	Sweden – rural	FM: No criteria stated. CWP: pain > 3 months in more than 3 locations in upper and lower body.	190 (130, 260)*	1,070 (930, 1,230)*

Study population	Study	Sample size	Sample Age	Location	Diagnostic criteria	FM	CWP
Male & female adults	Andersson et al. 1999 (1996 figures)	7,474	25–74	Sweden	Coding prevalence of ICD-8: 7179; ICD-9: 728 codes for fibrositis/fibromyalgia in primary care.	330 (290, 370)*	
	Assumpção et al. 2009	768	35–60	Sao Paulo, Brazil – low socioeconomic status	ACR-90 – including tender point examination	440 (270, 630)	2,400 (2,100, 2,700)
	Bazelmans et al. 1999	3,881	all	The Netherlands	Practice prevalence estimated by GPs	16 (7, 34)*	
	Bergman et al. 2001	2,425	20–74	Sweden	ACR-90 CWP criteria		1,140 (1,010, 1,260)
	Branco et al, 2010	4,517	15+	Five European countries	ACR-90 – including tender point examination	290 (240, 360)	1,300 (1,200, 1,400)*
	France	1,014		France		140 (70, 210)	1,000 (830, 1,200)*
	Germany	1,002		Italy		370 (260, 480)	1,000 (830, 1,200)*
	Italy	1,000		Germany		320 (210, 430)	1,100 (920, 1,310)*
	Portugal	500		Portugal		360 (200, 520)	1,300 (1,030, 1,620)*
	Spain	1,001		Spain		230 (140, 320)	2300 (2,050, 2,570)*
	Buskila et al. 2000	2,210	18+	Israel	ACR-90 CWP criteria		1,020 (870, 1,110)
	Carnes et al. 2007	2,445	18+	South East, UK	ACR-90 CWP criteria		1,200 (1,080, 1,330)*
	Cardiel & Serrano 2002	2,500	18+	Mexico – suburban	ACR-90 – including tender point examination	140 (100, 200)	
	Carmona et al. 2001	2,198	20+	Spain	ACR-90 – including tender point examination	240 (150, 320)	
	Chaaya et al.2012	3,530	15+	Lebanon	ACR-90 – including tender point examination	100 (60, 130)	
	Chen et al. 2008	1,094	all	Taiwan			
				Based on ACR-90	Criteria developed from ACR-90	670 (530, 830)*	
				Based on LFESSQ**	Criteria based on LFESSQ	980 (820, 1,170)*	

Study population	Study	Sample size	Sample Age	Location	Diagnostic criteria	FM	CWP
Male & female adults	Choudhury et al. 2013		18+	Tower Hamlets, London, UK	ACR-90 CWP criteria		
	Short postal survey	1,223		*Short postal survey*			
	White British/Irish	571		White British/Irish			1,000 (200, 1,800)
	British Bangladeshi	141		British Bangladeshi			900 (0, 2,500)
	Bangladeshi	201		Bangladeshi			1,600 (300, 2,800)
	Other ethnic groups	310		Other ethnic groups			900 (0, 2,000)
	Long questionnaire	600		*Long questionnaire*			
	White British/Irish	294		White British/Irish			600 (0, 1,800)
	British Bangladeshi	158		British Bangladeshi			900 (0, 2,400)
	Bangladeshi	141		Bangladeshi			1,800 (300, 3,300)
	Croft et al. 1993	1,340	18–85	Cheshire, UK	ACR-90 CWP criteria		1,120 (960, 1,300)*
	Dans et al. 1997	3,006	15+	Philippines	ACR-90 – including tender point examination	20 (10, 40)*	
	Davatchi et al. 2008	10,291	15+	Iran – urban	No criteria stated	69 (54, 87)*	
	Davatchi et al. 2009a	1,565	15+	Iran – rural	ACR-90 including tender point examination	6 (0, 123)	
	Farooqi & Gibson 1998	1,997	15+	Pakistan	No criteria stated	210 (160, 280)*	
	Rural	683		Rural		260 (170, 410)*	
	Urban affluent	608		Urban affluent		10 (3, 90)*	
	Urban poor	706		Urban poor		320 (220, 480)*	
	Guermazi et al. 2008	1,000	15+	Tunisia	ACR-90 – including tender point examination	670 (530, 840)*	
	Hagen et al. 2005	35,751	20+	Nord-Trøndelag, Norway	Pain complaints for at least 3 months during the last year and 15 days+ with pain during the last month from 3 different regions (neck or shoulder, hip or back, wrist/hands, knees or ankles/feet)		440 (420, 460)*
	Haq et al. 2005	5,211	15+	Bangladesh	ACR-90 – including tender point examination	360 (310, 410)*	
	Rural	2,635		Rural		440 (370, 530)	
	Urban affluent	1,259		Urban affluent		330 (240, 440)	
	Urban slum	1,317		Urban slum		320 (230, 440)	
	Hardt et al. 2008	10,271	20+	USA	ACR-90 CWP criteria		360 (310, 420)

Study population	Study	Sample size	Sample Age	Location	Diagnostic criteria	FM	CWP
Male & female adults	Häuser et al. 2009b	2,524	14+	Germany	Based on ACR-90 criteria, no examination conducted	380 (290, 440)*	
	Häuser et al. 2013	2,510	14+	Germany	CWP is defined as a ACR-2010 widespread pain index of 6 or over lasting a minimum of three months.		580 (497, 680)*
	Hughes et al. 2006	1,255, 556	no age limits	UK	Read codes N248, N239 and N2412, OXMIS code 7339F	18 (17, 19)*	
	Hunt et al. 1999	1,953	18–65	Manchester, UK – suburban			
	ACR-90			ACR-90	ACR-90 CWP criteria		1,290 (1,150, 1,450)
	Manchester			Manchester	Manchester criteria		470 (390, 570)
	Jacobsson et al. 1996	105	35–70	Pima Indians	ACR-90 CWP criteria		0 (0, 350)
	Joshi & Chopra 2009	8,145	16+	Pune, India – urban	ACR-90 – including tender point examination	5 (1, 13)	
	Kim et al. 2006	1,028	no age limits	South Korea – rural	ACR-90 – including tender point examination	224 (150, 333)*	1,401 (1,202, 1,626)*
	Klemp et al. 2002	689	12+	New Zealand	ACR-90 – including tender point examination	130 (10, 240)	280 (160, 430)
	Kurita et al. 2012	14,925	16+	Denmark	Pain in 4 or more sites lasting 6 months or longer.		
	Danish	14,033		Danish			460 (427, 496)*
	Other Western	395		Other Western			405 (251, 648)*
	Non-Western	497		Non-Western			1,026 (789, 1,324)*
	Lindell et al. 2000	147	18–74	Sweden	ACR-90 – including tender point examination	130 (80, 170)	420 (340, 500)
	Macfarlane et al. 2005 (survey A)		18–75	UK	ACR-90 CWP criteria		
	South Asian	1945		South Asian			1,380 (1,240, 1,550)*
	White European	932		White European			1,180 (990, 1,400)*
	Mäkelä & Heliövaara 1991	7,217	30+	Finland	Yunus et al. criteria	75 (57, 97)*	
	Marschall et al. 2011	6,897,846	any	Germany	ICD-10 diagnosis M79.7 coded at least twice	28 (28, 29)*	
	McNally et al. 2006	131,535	12+	Canada	Self-reported recall of diagnosis	110 (100, 120)	

Study population	Study	Sample size	Sample Age	Location	Diagnostic criteria	FM	CWP
Male & female adults	Minaur et al. 2004	847	15+	Australia – Aboriginal community	ACR-90 – including tender point examination	12 (2, 66)*	
	Papageorgiou et al. 2002	1,386	27–90	Handforth, UK	ACR-90 CWP criteria		1,000 (860, 1,170)*
	Pelaez-Ballestas et al. 2011	19,213	18+	Mexico	ACR-90 – including tender point examination	68 (56, 80)	
	Perrot et al. 2011	3,081	18+	France	ACR-90 – including tender point examination	160 (120, 200)	
	Picavet & Hazes 2003	3,664	25+	Netherlands	Self-reported recall of diagnosis	120 (90, 160)*	
	Prescott et al. 1993	1,219	18–79	Denmark	ACR-90 – including tender point examination	66 (28, 129)	
	Raspe & Baumgartner 1993	438	25–74	Bad Sackingen, Germany	ACR-90 – including tender point examination	200 (110, 390)*	1,200 (940, 1,550)
	Reyes-Llerena et al. 2000	300	adult	Cuba	According to 'generally accepted case definitions among rheumatologists'	70 (20, 240)*	
	Reyes-Llerena et al. 2009	3,155	15+	Cuba	ACR-90 – including tender point examination	22 (9, 40)	
	Rodriguez-Amado et al. 2011	4,713	18+	Mexico	ACR-90 – including tender point examination	80 (60, 110)	
	Salaffi et al. 2005	2,155	18+	Italy	ACR-90 – including tender point examination	222 (136, 319)	
	Sauer et al. 2011	1,646,284	all	Germany	Coding prevalence of ICD-10 diagnosis M79.7 in insurance company database.	45 (43, 46)*	
	Scudds et al. 2006	1,467	18–65	Hong Kong	ACR-90 – including tender point examination	82 (35, 129)	440 (340, 550)*
	Senna et al, 2004	3,038	16+	Brazil – urban	ACR-90 – including tender point examination	250 (197, 312)	
	Storozhenko et al. 2004	120	27–75	Yekaterinburg, Russia	ACR-90 CWP criteria		1,330 (838, 2,056)*
	Svebak et al, 2006	64,690	20+	Norway	Chronic (>3 months) axial skeletal pain and pain above and below the waist		1,260 (1,230, 1,280)
	Turhanoglu et al. 2008	600	20+	Turkey – urban	ACR-90 – including tender point examination	880 (680, 1140)*	
	Veerapan et al. 2007	2,594	15+	Malaysia	No criteria stated	93 (62, 137)*	
	Vincent et al. 2013		21+	Olmsted county, Minnesota			
	Self report	830		Self report	ACR-2010	530 (385, 712)	
	Medical records	County population		Medical records	Documented FM diagnosis in medical records	110 (107, 120)	

Study population	Study	Sample size	Sample Age	Location	Diagnostic criteria	FM	CWP
Male & female adults	White et al. 1999	3,395	18+	London, Canada – urban	ACR-90 – including tender point examination	330 (320, 340)	
	White et al. 2003		18+	London, Canada – rural	ACR-90 – including tender point examination		
	Amish	179		Amish		720 (530, 970)	1,450 (1,010, 2,040)*
	non-Amish	494		non-Amish		120 (60, 260)*	890 (670, 1180)*
	Wolfe et al. 1995	3,006	18+	Wichita, USA – urban	ACR-90 – including tender point examination	200 (140, 270)	1060 (950, 1170)
	Wolfe et al. 2013	2,445	18+	Germany	ACR-2010	210 (160, 270)	
	Zeng et al. 2010		16+	China	ACR-90 – including tender point examination		
	Shantou	2,350		Shantou		3 (0, 10)*	
	Taiyuan	3,916		Taiyuan		10 (0, 30)*	

*95% CI calculated from sample size and prevalence estimate.
**LFESSQ: London Fibromyalgia Epidemiology Survey Screening Questionnaire (White et al. 1999).

Chapter 4 appendix

A4.1 Read codes for non-specific generalised pain

Table A4.1 Group 1 – FM Read codes.

Read Code	Read Term
N239	Fibromyalgia
N248	Fibromyalgia

Table A4.2 Group 2 – FM & myofascial pain syndrome Read codes.

Read Code	Read Term
N2480	Myofascial pain syndrome
N2401	Fibrositis unspecified
N2402	Muscular rheumatism
N240z	Rheumatism/fibrositis NOS
N2412	Fibromyositis NOS
N248	Fibromyalgia
N239	Fibromyalgia
N240	Rheumatism/fibrositis unspecified

Table A4.3 Group 3 – Generalised osteoarthritis Read codes.

Read Code	Read Term
N05	Osteoarthritis
N050	Generalised osteoarthritis - OA
N0500	Generalised OA-site unspecified
N0502	Generalised OA-multiple sites
N0504	Primary general osteoarthrosis
N0505	Secondary multiple arthrosis
N050z	Generalised osteoarthritis NOS
N05z	Joint degeneration
N05z0	Osteoarthritis NOS-site unspecified
N05z8	Osteoarthritis NOS-other specified
N05zz	Osteoarthritis NOS

Table A4.4 Group 4 – ALL non-specific generalised musculoskeletal pain Read codes excluding OA.

Read Code	Read Term
1D12	C/O: stiffness
1DCC	Aching muscles
N04y1	Sero negative arthritis
N096	Musculoskeletal pain - joints
N0968	Other joint sympt.-other spec.
N0969	Other joint sympt.-multip.site
N096z	Other joint symptoms NOS
N09y	Other spec. joint disorders
N09y0	Other joint dis.-site unspec.
N09y8	Other joint dis.-other specif.
N09y9	Other joint dis.-multiple site
N09yz	Other joint disorders NOS
N248	Fibromyalgia
N24z	Polyalgia
N06	Other/unspecif. arthropathies
N063	Menopausal arthritis
N0630	Climacteric arthr.-site unsp.
N0638	Climacteric arthr.-other spec.
N0639	Climacteric arthr.-multip.site
N063z	Climacteric arthr.-NOS
N065	Polyarthropathy NEC
N0650	Unsp.polyarthr.-site unspecif.
N0658	Unsp.polyarthr.-other specif.
N0659	Unsp.polyarthr.-multiple site
N065A	Generalised arthritis
N065z	Polyarthritis
N2y	Nonarticular rheumatism OS
N2z	Nonarticular rheumatism NOS
N06z	Arthritis
N06z0	Arthropathy NOS-site unspecif.
N06z8	Arthropathy NOS-other specif.
N06z9	Arthropathy NOS-multiple sites
N06zB	Chronic arthritis
N06zz	Arthropathy NOS
N09	Other/unspecif.joint disorders
N094	Ache in joint
N0940	Arthralgia - site unspecified
N0948	Arthralgia - other specified
N0949	Arthralgia of multiple joints
N094z	Arthralgia NOS
N095	Joint stiffness NEC
N0950	Stiff joint NEC-site unspecif.
N0958	Stiff joint NEC-other specif.
N0959	Multiple stiff joints
N095z	Joint stiffness NEC NOS
N2412	Fibromyositis NOS
N241z	Myalgia/myositis NOS
N247	Other musculoskel.limb sympts.
N2411	Myositis unspecified
N09z	Joint disorders NOS
N39	Nonallopathic lesions, NEC
N39z	Nonallopathic lesion NEC NOS
N3y	Musculoskeletal disorders OS
N3z	Other musculoskeletal dis. NOS
Ny	Musculoskeletal diseases OS
Nyu3	[X]Other joint disorders
Nyu8	[X]Disorders of muscles
Nyu80	[X]Other myositis
Nyu85	[X]Oth spcf disorders/muscle
Nyu8A	[X]Oth disordrs/muscle/dis CE
Nyu8B	[X]Disorder of muscle, unspec
Nyu9	[X]Disorders/synovium+tendon
NyuA	[X]Other soft tissue disorders
NyuAA	[X]Oth sft tis diso/oth dis CE
NyuAF	[X]Oth spcf soft tissu disords
NyuAG	[X]Uns sof tis d,use/overu/prs
Nz	Musculoskeletal diseases NOS
R00z2	[D]General aches and pains
R01	[D]Musculoskeletal symptoms
R01z	[D]Nerv/musculoskel.symp.other
R01z2	[D]Musculoskeletal pain
R01zz	[D]Nerv/musculoskel.sympt.NOS
Ryu70	[X]Other chronic pain
N2480	Myofascial pain syndrome
N06y9	Other spec.arthr.-multipl.site
N06yz	Other specif.arthropathy NOS
N09z8	Joint disord.NOS-other specif.
N09z9	Joint disord.NOS-multiple site
N09zz	Joint disorders NOS
N0z	Arthropathies NOS
N2	Rheumatism, excl.the back
N22yz	Other tendon disorder NOS
N22z	Synovium/tendon/bursa dis.NOS
N23	Muscle/ligament/fascia disord.
N233z	Other specif.musc.disorder NOS
N239	Fibromyalgia
N23y	Other muscle/ligament/fascia
N23yz	Other musc./lig./fasc.dis.NOS
N23z	Muscle/ligament/fascia dis.NOS
N24	Other soft tissue disorders
N240	Rheumatism/fibrositis unspecif
N2400	Rheumatism unspecified
N2401	Fibrositis unspecified
N2402	Muscular rheumatism
N2403	Rheumatic pain
N240z	Rheumatism/fibrositis NOS
N241	Myalgia/myositis unspecified
N2410	Muscle pain
N09z0	Joint disord.NOS-site unspecif

Table A4.5 Group 5 – ALL generalised musculoskeletal pain Read codes (including OA).

Read Code	Read Term
1D12	C/O: stiffness
1DCC	Aching muscles
N04y1	Sero negative arthritis
N05	Osteoarthritis
N050	Generalised osteoarthritis - OA
N0500	Generalised OA-site unspecif.
N0502	Generalised OA-multiple sites
N0504	Primary general osteoarthrosis
N0505	Secondary multiple arthrosis
N050z	Generalised osteoarthritis NOS
N05z	Joint degeneration
N05z0	Osteoarthritis NOS-site unspec
N05z8	Osteoarthritis - other joint
N05zz	Osteoarthritis NOS
N06	Other/unspecif. arthropathies
N063	Menopausal arthritis
N0630	Climacteric arthr.-site unsp.
N0638	Climacteric arthr.-other spec.
N0639	Climacteric arthr.-multip.site
N063z	Climacteric arthr.-NOS
N065	Polyarthropathy NEC
N0650	Unsp.polyarthr.-site unspecif.
N0658	Unsp.polyarthr.-other specif.
N0659	Unsp.polyarthr.-multiple site
N065A	Generalised arthritis
N065z	Polyarthritis
N2y	Nonarticular rheumatism OS
N2z	Nonarticular rheumatism NOS
N06z	Arthritis
N06z0	Arthropathy NOS-site unspecif.
N06z8	Arthropathy NOS-other specif.
N06z9	Arthropathy NOS-multiple sites
N06zB	Chronic arthritis
N06zz	Arthropathy NOS
N09	Other/unspecif.joint disorders
N094	Ache in joint
N0940	Arthralgia - site unspecified
N0948	Arthralgia - other specified
N0949	Arthralgia of multiple joints
N094z	Arthralgia NOS
N095	Joint stiffness NEC
N0950	Stiff joint NEC-site unspecif.
N0958	Stiff joint NEC-other specif.
N0959	Multiple stiff joints
N095z	Joint stiffness NEC NOS
N096	Musculoskeletal pain - joints
N0968	Other joint sympt.-other spec.
N0969	Other joint sympt.-multip.site
N096z	Other joint symptoms NOS
N09y	Other spec. joint disorders
N09y0	Other joint dis.-site unspec.
N09y8	Other joint dis.-other specif.
N09y9	Other joint dis.-multiple site
N09yz	Other joint disorders NOS
N09z	Joint disorders NOS
N39	Nonallopathic lesions, NEC
N39z	Nonallopathic lesion NEC NOS
N3y	Musculoskeletal disorders OS
N3z	Other musculoskeletal dis. NOS
Ny	Musculoskeletal diseases OS
Nyu3	[X]Other joint disorders
Nyu8	[X]Disorders of muscles
Nyu80	[X]Other myositis
Nyu85	[X]Oth spcf disorders/muscle
Nyu8A	[X]Oth disordrs/muscle/dis CE
Nyu8B	[X]Disorder of muscle, unspec
Nyu9	[X]Disorders/synovium+tendon
NyuA	[X]Other soft tissue disorders
NyuAA	[X]Oth sft tis diso/oth dis CE
NyuAF	[X]Oth spcf soft tissu disords
NyuAG	[X]Uns sof tis d,use/overu/prs
Nz	Musculoskeletal diseases NOS
R00z2	[D]General aches and pains
R01	[D]Musculoskeletal symptoms
R01z	[D]Nerv/musculoskel.symp.other
R01z2	[D]Musculoskeletal pain
R01zz	[D]Nerv/musculoskel.sympt.NOS
Ryu70	[X]Other chronic pain
N2480	Myofascial pain syndrome
N06y9	Other spec.arthr.-multipl.site
N06yz	Other specif.arthropathy NOS
N09z8	Joint disord.NOS-other specif.
N09z9	Joint disord.NOS-multiple site
N09zz	Joint disorders NOS
N0z	Arthropathies NOS
N2	Rheumatism, excl.the back
N22yz	Other tendon disorder NOS
N22z	Synovium/tendon/bursa dis.NOS
N23	Muscle/ligament/fascia disord.
N233z	Other specif.musc.disorder NOS
N239	Fibromyalgia
N23y	Other muscle/ligament/fascia
N23yz	Other musc./lig./fasc.dis.NOS
N23z	Muscle/ligament/fascia dis.NOS
N24	Other soft tissue disorders
N240	Rheumatism/fibrositis unspecif
N2400	Rheumatism unspecified
N2401	Fibrositis unspecified
N2402	Muscular rheumatism
N2403	Rheumatic pain
N240z	Rheumatism/fibrositis NOS
N241	Myalgia/myositis unspecified
N2410	Muscle pain
N2411	Myositis unspecified
N2412	Fibromyositis NOS
N241z	Myalgia/myositis NOS
N247	Other musculoskel.limb sympts.
N248	Fibromyalgia
N24z	Polyalgia
N09z0	Joint disord.NOS-site unspecif

Chapter 5 appendix

A5.1 Rohrbeck-2007 Read code list

Table A5.1 Read codes used in the original Rohrbeck-2007 criteria.

Read code	Clinical term	Axial	Upper Limb	Lower Limb
16A2	Stiff neck	✓	×	×
16AZ	Stiff neck symptom NOS	✓	×	×
16C	Backache symptom	✓	×	×
16C2	Backache	✓	×	×
16C3	Backache with radiation	✓	×	×
16C4	Back pain worse on sneezing	✓	×	×
16C5	C/O - low back pain	✓	×	×
16C6	Back pain without radiation NOS	✓	×	×
16C7	C/O - upper back ache	✓	×	×
16CZ	Backache symptom NOS	✓	×	×
2H23	O/E - painful arc	×	✓	×
N0511	Local primary OA-shoulder regn	×	✓	×
N0512	Local primary OA-upper arm	×	✓	×
N0513	Local primary OA-forearm	×	✓	×
N0515	Local primary OA-pelvic/thigh	×	×	✓
N0516	Local primary OA-lower leg	×	×	✓
N0519	Primary coxarthrosis, bilat	×	×	✓
N051B	Primary gonarthrosis, bilat	×	×	✓
N051F	Local prim osteoarth elbow	×	✓	×
N0521	Local secondary OA-shoulder	×	✓	×
N0522	Local secondary OA-upper arm	×	✓	×
N0523	Local secondary OA-forearm	×	✓	×
N0525	Local secondary OA-pelv./thigh	×	×	✓
N0526	Local secondary OA-lower leg	×	×	✓
N0531	Local OA unsp. -shoulder region	×	✓	×
N0532	Local OA unsp.-upper arm	×	✓	×
N0533	Local OA unsp.-forearm	×	✓	×
N0535	Hip osteoarthritis NOS	×	×	✓
N0536	Local.OA unsp.-lower leg	×	×	✓
N0541	Oligoartic OA, unspec-shoulder	×	✓	×
N0542	Oligoartic OA, unspec-upp arm	×	✓	×
N0543	Oligoartic OA, unspec-forearm	×	✓	×
N0544	Oligoartic OA, unspec-hand	×	✓	×
N0545	Oligoartic OA, unspec-pelvic/thi	×	×	✓
N0546	Oligoartic OA, unspec-leg	×	×	✓
N05z1	Osteoarthritis NOS-shoulder	×	✓	×
N05z2	Elbow osteoarthritis NOS	×	✓	×
N05z3	Osteoarthritis NOS-forearm	×	✓	×
N05z5	Hip osteoarthritis NOS	×	×	✓
N05z6	Knee osteoarthritis NOS	×	×	✓
N05z9	Osteoarthritis NOS, shoulder	×	✓	×
N05zA	OA NOS-sternoclavicular joint	×	✓	×
N05zB	OA NOS-acromioclavicular joint	×	✓	×
N05zC	OA NOS-elbow	×	✓	×
N05zE	OA NOS-wrist	×	✓	×
N05zJ	OA NOS-hip	×	×	✓
N05zL	Osteoarthritis NOS, of knee	×	×	✓
N06	Other/unspecif. Arthropathies	×	×	×
N063	Climacteric arthritis	×	×	×
N06y	Other specified arthropathy	×	×	×
N06z	Arthritis	×	×	×
N06z8	Arthropathy NOS-other specif.	×	×	×

Read code	Clinical term	Axial	Upper Limb	Lower Limb
N06z9	Arthropathy NOS-multiple sites	×	×	×
N06zB	Chronic arthritis	×	×	×
N06zz	Arthropathy NOS	×	×	×
N066	Coxitis	×	×	✓
N06z1	Shoulder arthritis NOS	×	✓	×
N06z2	Elbow arthritis NOS	×	✓	×
N06z3	Wrist arthritis NOS	×	✓	×
N06z5	Hip arthritis NOS	×	×	✓
N06z6	Arthropathy NOS-lower leg	×	×	✓
N06z7	Ankle arthritis NOS	×	×	✓
N0948	Arthralgia of other specified site	×	×	×
N095	Joint stiffness NEC	×	×	×
N095z	Joint stiffness NEC, NOS	×	×	×
N0941	Arthralgia - shoulder	×	✓	×
N0942	Arthralgia -upper arm	×	✓	×
N0943	Arthralgia - forearm	×	✓	×
N0944	Arthralgia - hand	×	✓	×
N0945	Arthralgia - pelvic/thigh	×	×	✓
N0946	Arthralgia - lower leg	×	×	✓
N0947	Ankle joint pain	×	×	✓
N094A	Arthralgia of shoulder	×	✓	×
N094B	Arthralgia - sternoclav joint	×	✓	×
N094C	Arthralgia - acromioclav joint	×	✓	×
N094D	Arthralgia of elbow	×	✓	×
N094E	Arthralgia of distal radio-ulnar joint	×	✓	×
N094F	Arthralgia of wrist	×	✓	×
N094K	Hip pain	×	×	✓
N094L	Arthralgia of sacro-iliac joint NEC	×	×	✓
N094M	Arthralgia of knee	×	×	✓
N094N	Arthralgia of tibio-fibular joint	×	×	✓
N094P	Arthralgia of ankle	×	×	✓
N094W	Anterior knee pain	×	×	✓
N0950	Stiff joint NEC-site unspecif.	×	×	×
N0951	Shoulder stiff	×	✓	×
N0952	Elbow stiff	×	✓	×
N0953	Stiff joint NEC-forearm	×	✓	×
N0955	Hip stiff	×	×	✓
N0956	Knee stiff	×	×	✓
N0957	Ankle stiff	×	×	✓
N0958	Stiff joint NEC-other specif.	×	×	×
N0959	Multiple stiff joints	×	×	×
N095A	Stiff shoulder NEC	×	✓	×
N095C	Stiff acromioclavic joint NEC	×	✓	×
N095D	Stiff elbow NEC	×	✓	×
N095E	Stiff distal radio-ulnar joint NEC	×	✓	×
N095F	Stiff wrist NEC	×	✓	×
N095K	Stiff hip NEC	×	×	✓
N095L	Stiff sacro-iliac joint NEC	×	×	✓
N095M	Stiff knee NEC	×	×	✓
N095N	Stiff tibio-fibular joint NEC	×	×	✓
N095P	Stiff ankle NEC	×	×	✓
N0960	Other joint sympt.-site unspec	×	×	×
N11	Arthritis of spine	✓	×	×
N110	Cervical spond. -no myelopathy	✓	×	×
N119	Cx spondylosis + radiculopathy	✓	×	×
N11z	Osteoarthritis spine	✓	×	×
N131	Cervicalgia - pain in neck	✓	×	×
N135z	Stiff neck NOS	✓	×	×
N13y2	Crick in neck	✓	×	×

Read code	Clinical term	Axial	Upper Limb	Lower Limb
N13yz	Other cervical syndromes NOS	✓	×	×
N13z	Cervical/neck disorder NOS	✓	×	×
N14	Other/unspecif.back disorder	✓	×	×
N141	Acute back pain - thoracic	✓	×	×
N142	Acute back pain - lumbar	✓	×	×
N1420	Lumbago with sciatica	✓	×	✓
N143	Acute back pain + sciatica	✓	×	✓
N145	Backache, unspecified	✓	×	×
N149	Back stiffness	✓	×	×
N210	Adhesive capsulitis - shoulder	×	✓	×
N211	Rotator cuff shoulder syndrome	×	✓	×
N2110	Rotator cuff syndrome, unspecified	×	✓	×
N2111	Calcifying tendinitis of the shoulder	×	✓	×
N2112	Bicipital tenosynovitis	×	✓	×
N2113	Supraspinatus tendinitis	×	✓	×
N2116	Subacromial bursitis	×	✓	×
N2117	Subdeltoid bursitis	×	✓	×
N2118	Bursitis of shoulder	×	✓	×
N211z	Rotator cuff syndrome NOS	×	✓	×
N2120	Periarthritis of shoulder	×	✓	×
N2121	Scapulohumeral fibrositis	×	✓	×
N2125	Shoulder tendonitis	×	✓	×
N2131	Medial epicondylitis of the elbow	×	✓	×
N2132	Lateral epicondylitis - elbow	×	✓	×
N2151	Bursitis of hip	×	×	✓
N2160	Bursitis of knee NOS	×	×	✓
N220S	Synovitis of hip	×	×	✓
N220z	Shoulder synovitis	×	✓	×
N2452	Pain in leg	×	×	✓
N2453	Pain in arm	×	✓	×
N2454	Calf pain	×	×	✓
N2457	Shoulder pain	×	✓	×
R04zz	[D] Head and neck symptoms NOS	×	✓	×
S50	Sprain of shoulder and upper arm	×	✓	×
S5700	Neck sprain, unspecified	✓	×	×
S570z	Neck sprain NOS	✓	×	×

Table A5.2. Ambiguous codes that could represent regional or generalised conditions included in the original 2007 Rohrbeck criteria.

Read code	Clinical term
N06	Other/unspecif. Arthropathies
N063	Climacteric arthritis
N06y	Other specified arthropathy
N06z	Arthritis
N06z8	Arthropathy NOS-other specif.
N06zB	Chronic arthritis
N06zz	Arthropathy NOS
N0948	Arthralgia of other specified site
N095	Joint stiffness NEC
N0950	Stiff joint NEC-site unspecif.
N0958	Stiff joint NEC-other specif.
N095z	Joint stiffness NEC, NOS
N0960	Other joint sympt.-site unspec

A5.2 All regional musculoskeletal Read codes

Table A5.3 All regional musculoskeletal Read codes.

Read Code	Read Term	Axial	Lower Limb	Upper Limb	Clinician Defined	Read Code	Read Term	Axial	Lower Limb	Upper Limb	Clinician Defined
14G3	H/O: knee problem	×	✓	×	×	S1103	Clsd # C1-C4 cent cord lesion	✓	×	×	×
14G4	H/O: back problem	✓	×	×	×	S1104	Clsd # C1-C4 post cord lesion	✓	×	×	×
14G7	H/O: hip fracture	×	✓	×	×	S1105	Clsd # C1-C4 incomp cord les	✓	×	×	×
14G8	H/O: vertebral fracture	✓	×	×	×	S1106	Clsd # C5-C7 unspec cord les	✓	×	×	×
14H5	H/O: cong. dislocation - hip	×	✓	×	×	S1107	Clsd # C5-C7 complete cord les	✓	×	×	×
14J1	H/O: head injury	×	×	×	×	S1108	Clsd # C5-C7 ant cord lesion	✓	×	×	×
14J2	H/O: facial injury	×	×	×	×	S1109	Clsd # C5-C7 cent cord lesion	✓	×	×	×
14N30	H/O Spinal surgery	✓	×	×	×	S110A	Clsd # C5-C7 post cord lesion	✓	×	×	×
14V50	H/0: arthrodesis toe	×	✓	×	×	S110B	Clsd # C5-C7 incomp cord les	✓	×	×	×
16A	Stiff neck symptom	✓	×	×	✓	S110z	Closed cervical#+cord lesn.NOS	✓	×	×	×
16A1	No stiff neck	✓	×	×	×	S111	Open cervical #+cord lesion	✓	×	×	×
16A2	Stiff neck	✓	×	×	✓	S1110	Op # C1-C4 unspec cord les	✓	×	×	×
16A3	Torticollis - symptom	✓	×	×	✓	S1111	Op # C1-4 compl cord lesion	✓	×	×	×
16AZ	Stiff neck symptom NOS	✓	×	×	✓	S1112	Op # C1-4 ant cord lesion	✓	×	×	×
16C	Backache symptom	✓	×	×	✓	S1113	Op # C1-4 cent cord lesion	✓	×	×	×
16C1	No backache	✓	×	×	×	S1114	Op # C1-4 post cord lesion	✓	×	×	×
16C2	Backache	✓	×	×	✓	S1115	Op # C1-4 cord les. NOS	✓	×	×	×
16C3	Backache with radiation	✓	×	×	✓	S1116	Op # C5-7 unspec cord lesion	✓	×	×	×
16C4	Back pain worse on sneezing	✓	×	×	✓	S1117	Op # C5-7 compl cord lesion	✓	×	×	×
16C5	C/O - low back pain	✓	×	×	✓	S1118	Op # C5-7 anterior cord les	✓	×	×	×
16C6	Back pain without radiat NOS	✓	×	×	✓	S1119	Op # C5-7 central cord les	✓	×	×	×
16C7	C/O - upper back ache	✓	×	×	✓	S111A	Op # C5-7 posterior cord lesn	✓	×	×	×
16C9	Chronic low back pain	✓	×	×	✓	S111B	Op # C5-7 incomp cord les NOS	✓	×	×	×
16CA	Mechanical low back pain	✓	×	×	✓	S111z	Open cervical#+cord lesion NOS	✓	×	×	×
16CZ	Backache symptom NOS	✓	×	×	✓	S112	Closed thoracic #+cord lesion	✓	×	×	×
16J0	Swollen calf	×	✓	×	×	S1120	Cl sp #+unsp thor crd lsn,T1-6	✓	×	×	×
16J1	Swollen toe	×	✓	×	×	S1121	Cl sp #+cmpl thor crd lsn,T1-6	✓	×	×	×
16J2	Swollen thumb	×	×	✓	×	S1122	Cl spn #+ant thor crd lsn,T1-6	✓	×	×	×
16J3	Swollen joint	×	×	×	×	S1123	Cl spn #+cnt thor crd lsn,T1-6	✓	×	×	×
16J4	Swollen knee	×	✓	×	×	S1124	Cl spn #+pst thor crd lsn,T1-6	✓	×	×	×
16J5	Facial swelling	×	×	×	×	S1125	Cl # T1-6 incmpl cord lesn NOS	✓	×	×	×
16J6	Swollen hand	×	×	✓	×	S1126	Cl sp #+unsp thor cd lsn,T7-12	✓	×	×	×
16J7	Swollen foot	×	✓	×	×	S1127	Cl sp #+cmp thor crd lsn,T7-12	✓	×	×	×
182	Chest pain	✓	×	×	✓	S1128	Cl sp #+ant thor crd lsn,T7-12	✓	×	×	×
1822	Central chest pain	✓	×	×	✓	S1129	Cl sp #+cnt thor crd lsn,T7-12	✓	×	×	×
1823	Precordial pain	✓	×	×	✓	S112A	Cl sp #+pst thor crd lsn,T7-12	✓	×	×	×
1824	Anterior chest wall pain	✓	×	×	✓	S112B	Cl # T7-12incomp cord lsn NOS	✓	×	×	×
1826	Parasternal pain	✓	×	×	✓	S112z	Closed thoracic#+cord lesn.NOS	✓	×	×	×
1828	Atypical chest pain	✓	×	×	✓	S113	Open thoracic #+cord lesion	✓	×	×	×
182B	Rib pain	✓	×	×	✓	S1130	Op sp #+unsp thor crd lsn,T1-6	✓	×	×	×

Read Code	Read Term	Axial	Lower Limb	Upper Limb	Clinician Defined	Read Code	Read Term	Axial	Lower Limb	Upper Limb	Clinician Defined
182B0	Costal margin chest pain	✓	×	×	✓	S1131	Op sp #+cmpl thor crd lsn,T1-6	✓	×	×	×
182C	Chest wall pain	✓	×	×	✓	S1132	Op spn #+ant thor crd lsn,T1-6	✓	×	×	×
182Z	Chest pain NOS	✓	×	×	✓	S1133	Op spn #+cnt thor crd lsn,T1-6	✓	×	×	×
1832	Ankle swelling	×	✓	×	×	S1134	Op spn #+pst thor crd lsn,T1-6	✓	×	×	×
1833	Leg swelling	×	✓	×	×	S1135	Op # T1-6 incomp cord lsn NOS	✓	×	×	×
1834	Finger swelling	×	×	✓	×	S1136	Op sp #+unsp thor cd lsn,T7-12	✓	×	×	×
19690	Abdominal wall pain	×	×	×	✓	S1137	Op sp #+cmp thor crd lsn,T7-12	✓	×	×	×
197	Flank pain	×	×	×	✓	S1138	Op sp #+ant thor crd lsn,T7-12	✓	×	×	×
1974	Right subcostal pain	✓	×	×	✓	S1139	Op sp #+cnt thor crd lsn,T7-12	✓	×	×	×
1975	Left flank pain	×	×	×	✓	S113A	Op sp #+pst thor crd lsn,T7-12	✓	×	×	×
1976	Right flank pain	×	×	×	✓	S113B	Op # T7-12incomp cord lsn NOS	✓	×	×	×
1A53	C/O - loin pain	✓	×	×	✓	S113z	Open thoracic #+cord lesn.NOS	✓	×	×	×
1A59	C/O pelvic pain	×	✓	×	✓	S114	Closed lumbar # + cord lesion	✓	×	×	×
1D130	C/O - pain in toes	×	✓	×	✓	S1140	Cls spn # + unsp lumb crd lesn	✓	×	×	×
1D131	C/O - pain in big toe	×	✓	×	✓	S1141	Cls spn # + comp lumb crd lesn	✓	×	×	×
1D22	C/O - a chest wall symptom	✓	×	×	✓	S1142	Cls spn # + ant lumbr crd lesn	✓	×	×	×
1D24	Symptom: trunk posterior	✓	×	×	✓	S1143	Cls spn # + cent lumb crd lesn	✓	×	×	×
1M00	Elbow pain	×	×	✓	✓	S1144	Cls spn # + post lumb crd lesn	✓	×	×	×
1M1	Pain in lower limb	×	✓	×	✓	S1145	Cls spn # + cauda equina lesn	✓	×	×	×
1M10	Knee pain	×	✓	×	✓	S115	Open lumbar # + cord lesion	✓	×	×	×
1M11	Foot pain	×	✓	×	✓	S1150	Opn spn # + unsp lumb crd lesn	✓	×	×	×
1M12	Anterior knee pain	×	✓	×	✓	S1151	Opn spn # + comp lumb crd lesn	✓	×	×	×
N0100	Pyogenic arthr.-site unspecif.	×	×	×	×	S1152	Opn spn # + ant lumbr crd lesn	✓	×	×	×
N0101	Pyogenic arthr.-shoulder regn.	×	×	✓	×	S1153	Opn spn # + cent lumb crd lesn	✓	×	×	×
N0102	Pyogenic arthr.-upper arm	×	×	✓	×	S1154	Opn spn # + post lumb crd lesn	✓	×	×	×
N0103	Wrist pyogenic arthritis	×	×	✓	×	S1155	Opn spn # + cauda equina lesn	✓	×	×	×
N0104	Pyogenic arthr.-hand	×	×	✓	×	S115z	Op spn # incmp lmb crd lsn NOS	✓	×	×	×
N0105	Pyogenic arthr.-pelvic/thigh	×	✓	×	×	S116	Closed sacral # + cord lesion	✓	×	×	×
N0106	Pyogenic arthr.-lower leg	×	✓	×	×	S1160	Closed sacral#+cord lesn.unsp.	✓	×	×	×
N0107	Pyogenic arthr.-ankle/foot	×	✓	×	×	S1161	Cl.sacral#+compl.cauda equ.les	✓	×	×	×
N0111	Sex acqd reac arthrop-shoulder	×	×	✓	×	S1162	Cl.sacral#+other cauda equ.inj	✓	×	×	×
N0112	Sex acqd reac arthrop-upp arm	×	×	✓	×	S1163	Closed sacral#+other cord inj.	✓	×	×	×
N0113	Sex acqd reac arthrop-forearm	×	×	✓	×	S116z	Closed sacral#+cord lesion NOS	✓	×	×	×
N0114	Sex acqd reac arthrop-hand	×	×	✓	×	S117	Open sacral # + cord lesion	✓	×	×	×
N0115	Sex acqd reac arthrop-pelv/thi	×	✓	×	×	S1170	Open sacral#+cord lesion unsp.	✓	×	×	×
N0116	Sex acqd reac arthrop-leg	×	✓	×	×	S1171	Op.sacral#+compl.cauda equ.les	✓	×	×	×
N0117	Sex acqd reac arthrop-ank/foot	×	✓	×	×	S1172	Op.sacral#+other cauda equ.inj	✓	×	×	×
N0121	Arthrop+Behcet's synd-shoulder	×	×	✓	×	S1173	Open sacral#+other cord injury	✓	×	×	×
N0122	Arthrop+Behcet's synd-upp arm	×	×	✓	×	S117z	Open sacral#+cord lesion NOS	✓	×	×	×
N0123	Arthrop+Behcet's synd-forearm	×	×	✓	×	S118	Closed coccyx # + cord lesion	✓	×	×	×
N0124	Arthrop+Behcet's synd-hand	×	×	✓	×	S1180	Closed coccyx#+cord lesn.unsp.	✓	×	×	×
N0125	Arthrop+Behcet's synd-pelv/thi	×	✓	×	×	S1181	Cl.coccyx#+compl.cauda equ.les	✓	×	×	×
N0126	Arthrop+Behcet's synd-leg	×	✓	×	×	S1182	Cl.coccyx#+other cauda equ.inj	✓	×	×	×
N0127	Arthrop+Behcet's synd-ank/foot	×	✓	×	×	S1183	Closed coccyx#+other cord inj.	✓	×	×	×

Read Code	Read Term	Axial	Lower Limb	Upper Limb	Clinician Defined	Read Code	Read Term	Axial	Lower Limb	Upper Limb	Clinician Defined
N0131	Postdys react arthrop-shoulder	×	×	✓	×	S118z	Closed coccyx#+cord lesion NOS	✓	×	×	×
N0132	Postdys react arthrop-upp arm	×	×	✓	×	S119	Open coccyx # + cord lesion	✓	×	×	×
N0133	Postdys react arthrop-forearm	×	×	✓	×	S1190	Open coccyx#+cord lesion unsp.	✓	×	×	×
N0134	Postdys react arthrop-hand	×	×	✓	×	S1191	Op.coccyx#+compl.cauda equ.les	✓	×	×	×
N0135	Postdys react arthrop-pelv/thi	×	✓	×	×	S1192	Op.coccyx#+other cauda equ.inj	✓	×	×	×
N0136	Postdys react arthrop-leg	×	✓	×	×	S1193	Open coccyx#+other cord inj.	✓	×	×	×
N0137	Postdys react arthrop-ank/foot	×	✓	×	×	S119z	Open coccyx#+cord lesion NOS	✓	×	×	×
N0141	Arthr.+oth.bact.dis-shoulder	×	×	✓	×	S11x	Closed #spine+cord lesn.unsp.	✓	×	×	×
N0142	Arthr.+oth.bact.dis-upper arm	×	×	✓	×	S11y	Open #spine+cord lesion unsp.	✓	×	×	×
N0143	Arthr.+oth.bact.dis-forearm	×	×	✓	×	S11z	#Spine + cord lesion NOS	✓	×	×	×
N0144	Arthr.+oth.bact.dis-hand	×	×	✓	×	S12	#Rib/sternum/larynx/trachea	✓	×	×	×
N0145	Arthr.+oth.bact.dis-pelv/thigh	×	✓	×	×	S120	Closed fracture rib	✓	×	×	×
N0146	Arthr.+oth.bact.dis-lower leg	×	✓	×	×	S1200	Closed #rib unspecified	✓	×	×	×
N0147	Arthr.+oth.bact.dis-ankle/foot	×	✓	×	×	S1201	Closed #one rib	✓	×	×	×
N0150	Arthr.+oth.viral dis-site unsp	×	×	×	×	S1202	Closed # two ribs	✓	×	×	×
N0151	Arthr.+oth.viral dis-shoulder	×	×	✓	×	S1203	Closed # three ribs	✓	×	×	×
N0152	Arthr.+oth.viral dis-upper arm	×	×	✓	×	S1204	Closed # four ribs	✓	×	×	×
N0153	Arthr.+oth.viral dis-forearm	×	×	✓	×	S1205	Closed # five ribs	✓	×	×	×
N0154	Arthr.+oth.viral dis-hand	×	×	✓	×	S1206	Closed # six ribs	✓	×	×	×
N0155	Arthr+oth.viral dis.pelv/thigh	×	✓	×	×	S1207	Closed # seven ribs	✓	×	×	×
N0156	Arthr+oth.viral dis.lower leg	×	✓	×	×	S1208	Closed # eight or more ribs	✓	×	×	×
N0157	Arthr+oth.viral dis-ankle/foot	×	✓	×	×	S1209	Closed fracture multiple ribs	✓	×	×	×
N0160	Arthr.+mycoses-site unspecif.	×	×	×	×	S120A	Cough fracture	✓	×	×	×
N0161	Arthr.+mycoses-shoulder region	×	×	✓	×	S120z	Closed #rib(s) NOS	✓	×	×	×
N0162	Arthr.+mycoses-upper arm	×	×	✓	×	S121	Open fracture rib	✓	×	×	×
N0163	Arthr.+mycoses-forearm	×	×	✓	×	S1210	Open #rib unspecified	✓	×	×	×
N0164	Arthr.+mycoses-hand	×	×	✓	×	S1211	Open #one rib	✓	×	×	×
N0165	Arthr.+mycoses-pelvic/thigh	×	✓	×	×	S1212	Open #two ribs	✓	×	×	×
N0166	Arthr.+mycoses-lower leg	×	✓	×	×	S1213	Open #three ribs	✓	×	×	×
N0167	Arthr.+mycoses-ankle/foot	×	✓	×	×	S1214	Open #four ribs	✓	×	×	×
N0170	Arthr.+helminth.-site unspec.	×	×	×	×	S1215	Open #five ribs	✓	×	×	×
N0171	Arthr.+helminth.-shoulder regn	×	×	✓	×	S1216	Open #six ribs	✓	×	×	×
N0172	Arthr.+helminth.-upper arm	×	×	✓	×	S1217	Open #seven ribs	✓	×	×	×
N0173	Arthr.+helminth.-forearm	×	×	✓	×	S1218	Open #eight or more ribs	✓	×	×	×
N0174	Arthr.+helminth.-hand	×	×	✓	×	S1219	Open fracture multiple ribs	✓	×	×	×
N0175	Arthr.+helminth.-pelvic/thigh	×	✓	×	×	S121z	Open #rib(s) NOS	✓	×	×	×
N0176	Arthr.+helminth.-lower leg	×	✓	×	×	S122	Closed fracture sternum	✓	×	×	×
N0177	Arthr.+helminth.-ankle/foot	×	✓	×	×	S123	Open fracture sternum	✓	×	×	×
N01w0	Reactive arthropathy-shoulder	×	×	✓	×	S124	Flail chest	✓	×	×	×
N01w1	Reactive arthr-acromioclav jt	×	×	✓	×	S1240	Closed flail chest	✓	×	×	×
N01w2	Reactive arthrop-sternoclav jt	×	×	✓	×	S1241	Open flail chest	✓	×	×	×
N01w3	Reactive arthropathy of elbow	×	×	✓	×	S125	Closed # larynx and trachea	✓	×	×	×
N01w4	Reac arthrop-distal rad-uln jt	×	×	✓	×	S1250	Closed fracture larynx	✓	×	×	×
N01w5	Reactive arthropathy of wrist	×	×	✓	×	S1251	Closed #hyoid bone	✓	×	×	×

Read Code	Read Term	Axial	Lower Limb	Upper Limb	Clinician Defined	Read Code	Read Term	Axial	Lower Limb	Upper Limb	Clinician Defined
N01w6	Reactive arthropathy of MCPJ	×	×	✓	×	S1252	Closed #thyroid cartilage	✓	×	×	×
N01w7	Reactive arthropathy-PIPJ-fing	×	×	✓	×	S1253	Closed #trachea	✓	×	×	×
N01w8	Reactive arthropathy-DIPJ-fing	×	×	✓	×	S125z	Closed #larynx/trachea NOS	✓	×	×	×
N01w9	Reactive arthropathy of hip	×	✓	×	×	S126	Open # larynx and trachea	✓	×	×	×
N01wA	Reactive arthropathy-SI joint	✓	×	×	×	S1260	Open fracture larynx	✓	×	×	×
N01wB	Reactive arthropathy of knee	×	✓	×	×	S1261	Open #hyoid bone	✓	×	×	×
N01wC	Reactive arthrop of tib-fib jt	×	✓	×	×	S1262	Open #thyroid cartilage	✓	×	×	×
N01wD	Reactive arthropathy of ankle	×	✓	×	×	S1263	Open #trachea	✓	×	×	×
N01wE	Reactive arthrop-subtal joint	×	✓	×	×	S126z	Open #larynx/trachea NOS	✓	×	×	×
N01wF	Reactive arthrop-talonav joint	×	✓	×	×	S127	Fracture of rib	✓	×	×	×
N01wG	Reactive arthrop-oth tarsal jt	×	✓	×	×	S1270	Multiple fractures of ribs	✓	×	×	×
N01wH	Reactive arthropathy-1st MTPJ	×	✓	×	×	S1271	Cough fracture of ribs	✓	×	×	×
N01wJ	Reactive arthropathy-less MTPJ	×	✓	×	×	S128	Fracture of sternum	✓	×	×	×
N01wK	Reactive arthropathy-IPJ-toe	×	✓	×	×	S12X	Fract bony thor, part unsp	✓	×	×	×
N01y0	Arth+oth.inf/para-site unspec.	×	×	×	×	S12X0	Cl fract bony thorax part unsp	✓	×	×	×
N01y1	Arth+oth.inf/para-shoulder reg	×	×	✓	×	S12X1	Op fract bony thorax part unsp	✓	×	×	×
N01y2	Arth+oth.inf/para-upper arm	×	×	✓	×	S12y	Fract oth parts of bony thorax	✓	×	×	×
N01y3	Arth+oth.inf/para-forearm	×	×	✓	×	S12y0	Cl frac oth parts bony thorax	✓	×	×	×
N01y4	Arth+oth.inf/para-hand	×	×	✓	×	S12y1	Op fract oth parts bony thorax	✓	×	×	×
N01y5	Arth+oth.inf/para-pelvic/thigh	×	✓	×	×	S12z	#Rib/sternum/larynx/trach.NOS	✓	×	×	×
N01y6	Arth+oth.inf/para-lower leg	×	✓	×	×	S13	Fracture or disruption of pelvis	×	✓	×	×
N01y7	Arth+oth.inf/para-ankle/foot	×	✓	×	×	S130	Closed fracture acetabulum	×	✓	×	×
N01z0	Infect.arthr.NOS-site unspecif	×	×	×	×	S1300	Cls # acetabulum,ant lip alone	×	✓	×	×
N01z1	Infect.arthr.NOS-shoulder reg	×	×	✓	×	S1301	Cls # acetabulm,post lip alone	×	✓	×	×
N01z2	Infect.arthr.NOS-upper arm	×	×	✓	×	S1302	Cls # acetabulum,ant column	×	✓	×	×
N01z3	Infect.arthr.NOS-forearm	×	×	✓	×	S1303	Cls # acetabulum,post column	×	✓	×	×
N01z4	Infect.arthr.NOS-hand	×	×	✓	×	S1304	Cls # acetabulum, floor	×	✓	×	×
N01z5	Infect.arthr.NOS-pelvic/thigh	×	✓	×	×	S1305	Cls # acetabulm,dbl col transv	×	✓	×	×
N01z6	Infect.arthr.NOS-lower leg	×	✓	×	×	S1306	Cls # acetabulum,dbl col unsp	×	✓	×	×
N01z7	Infect.arthr.NOS-ankle/foot	×	✓	×	×	S130y	Othr spec cls # acetabulum	×	✓	×	×
N01z8	Infec arthritis NOS-shoulder	×	×	✓	×	S130z	Closed fracture acetabulum NOS	×	✓	×	×
N01z9	Infec arthr NOS-sternoclav jt	×	×	✓	×	S131	Open fracture acetabulum	×	✓	×	×
N01zA	Infec arth NOS-acromioclav jt	×	×	✓	×	S1310	Opn # acetabulum,ant lip alone	×	✓	×	×
N01zB	Infec arthritis NOS-elbow	×	×	✓	×	S1311	Opn # acetabulm,post lip alone	×	✓	×	×
N01zC	Infec arth NOS-dis rad-uln jt	×	×	✓	×	S1312	Opn # acetabulum,ant column	×	✓	×	×
N01zD	Infec arthritis NOS-wrist	×	×	✓	×	S1313	Opn # acetabulum,post column	×	✓	×	×
N01zE	Infec arthritis NOS-MCPJ	×	×	✓	×	S1314	Opn # acetabulum, floor	×	✓	×	×
N01zF	Infec arthritis NOS-PIPJ-fing	×	×	✓	×	S1315	Opn # acetabulm,dbl col transv	×	✓	×	×
N01zG	Infec arthritis NOS-DIPJ-fing	×	×	✓	×	S1316	Opn # acetabulum,dbl col unsp	×	✓	×	×
N01zH	Infec arthritis NOS-hip	×	✓	×	×	S131y	Othr spec opn # acetabulum	×	✓	×	×
N01zJ	Infec arthritis NOS-SI joint	✓	×	×	×	S131z	Open fracture acetabulum NOS	×	✓	×	×
N01zK	Infec arthritis NOS-knee	×	✓	×	×	S132	Closed fracture pubis	×	✓	×	×
N01zL	Infec arth NOS, tib-fib joint	×	✓	×	×	S1320	Cls # pelvis,sngle pubic ramus	×	✓	×	×
N01zM	Infec arthritis NOS-ankle	×	✓	×	×	S1321	Cls # plvs,mlti pbc rami-stble	×	✓	×	×

Read Code	Read Term	Axial	Lower Limb	Upper Limb	Clinician Defined
N01zN	Infec arth NOS-subtalar joint	×	✓	×	×
N01zP	Infec arth NOS-talonavic joint	×	✓	×	×
N01zQ	Infec arth NOS-oth tars joint	×	✓	×	×
N01zR	Infec arthritis NOS-1st MTPJ	×	✓	×	×
N01zS	Infec arthritis NOS-less MTPJ	×	✓	×	×
N01zT	Infec arthritis NOS-IPJ of toe	×	✓	×	×
N0200	Chondroc.-dical.ph.-site unsp.	×	×	×	×
N0201	Chondroc.-dical.ph.-shoulder	×	×	✓	×
N0202	Chondroc.-dical.ph.-upper arm	×	×	✓	×
N0203	Chondroc.-dical.ph.-forearm	×	×	✓	×
N0204	Chondroc.-dical.ph.-hand	×	×	✓	×
N0205	Chondroc.-dical.ph.-pelv/thigh	×	✓	×	×
N0206	Chondroc.-dical.ph.-lower leg	×	✓	×	×
N0207	Chondroc.-dical.ph.-ankle/foot	×	✓	×	×
N0210	Chondroc.-pyrophos.-site unsp.	×	×	×	×
N0211	Chondroc.-pyrophos.-shoulder	×	×	✓	×
N0212	Chondroc.-pyrophos.-upper arm	×	×	✓	×
N0213	Chondroc.-pyrophos.-forearm	×	×	✓	×
N0214	Chondroc.-pyrophos.-hand	×	×	✓	×
N0215	Chondroc.-pyrophos.-pelv/thigh	×	✓	×	×
N0216	Chondroc.-pyrophos.-lower leg	×	✓	×	×
N0217	Chondroc.-pyrophos.-ankle/foot	×	✓	×	×
N0220	Chondrocalc.unsp.-site unspec.	×	×	×	×
N0221	Chondrocalc.unsp.-shoulder reg	×	×	✓	×
N0222	Chondrocalc.unsp.-upper arm	×	×	✓	×
N0223	Chondrocalc.unsp.-forearm	×	×	✓	×
N0224	Chondrocalc.unsp.-hand	×	×	✓	×
N0225	Chondrocalc.unsp.-pelv/thigh	×	✓	×	×
N0226	Chondrocalc.unsp.-lower leg	×	✓	×	×
N0227	Chondrocalc.unsp.-ankle/foot	×	✓	×	×
N0230	Gouty arthritis-site unspecif.	×	×	×	×
N0231	Gouty arthritis-shoulder	×	×	✓	×
N0232	Gouty arthritis-upper arm	×	×	✓	×
N0233	Gouty arthritis-forearm	×	×	✓	×
N0234	Gouty arthritis-hand	×	×	✓	×
N0235	Gouty arthritis-pelvic/thigh	×	✓	×	×
N0236	Gouty arthritis-lower leg	×	✓	×	×
N0237	Gouty arthritis-ankle/foot	×	✓	×	×
N02y0	Other crystal arth.-site unsp.	×	×	×	×
N02y1	Other crystal arth.-shoulder	×	×	✓	×
N02y2	Other crystal arth.-upper arm	×	×	✓	×
N02y3	Other crystal arth.-forearm	×	×	✓	×
N02y4	Other crystal arth.-hand	×	×	✓	×
N02y5	Other crystal arth.-pelv/thigh	×	✓	×	×
S1322	Cls # plvs,mlti pbc rami-unstb	×	✓	×	×
S132y	Other spec closed # pubis	×	✓	×	×
S132z	Closed fracture pubis NOS	×	✓	×	×
S133	Open fracture of pubis	×	✓	×	×
S1330	Opn # plvs,sngle pubic ramus	×	✓	×	×
S1331	Opn # plvs,mlti pbc rami-stble	×	✓	×	×
S1332	Opn # plvs,mlti pbc rami-unstb	×	✓	×	×
S133y	Other spec open # pubis	×	✓	×	×
S133z	Open fracture of pubis NOS	×	✓	×	×
S134	Othr/multi clsd # pelvis	×	✓	×	×
S1340	Closed # ilium, unspec	×	✓	×	×
S1341	Closed # pelvis, ischium	×	✓	×	×
S1342	Clsd multi disrptions pelvis	×	✓	×	×
S1343	Cls # plvs, ischial tuberosity	×	✓	×	×
S1344	Cls # plvs,ant sup iliac spn	×	✓	×	×
S1345	Cls # plvs,ant inf iliiac spn	×	✓	×	×
S1346	Clsd # pelvis, iliac wing	×	✓	×	×
S1347	Clsd vertical # ilium	×	✓	×	×
S1348	Clsd # dislocatn sac-iliac jnt	✓	×	×	×
S134z	Othr/mlti clsd # pelvis NOS	×	✓	×	×
S135	Othr/mlti open # pelvis	×	✓	×	×
S1350	Open # ilium, unspec	×	✓	×	×
S1351	Open fracture pelvis, ischium	×	✓	×	×
S1352	Open multi disruptns pelvis	×	✓	×	×
S1353	Opn # pelvs,ischial tuberosity	×	✓	×	×
S1354	Opn # pelvs,ant sup iliac spn	×	✓	×	×
S1355	Opn # pelvs,ant inf iliac spn	×	✓	×	×
S1356	Opn # pelvis, iliac wing	×	✓	×	×
S1357	Open vertical # ilium	×	✓	×	×
S1358	Opn # disloctn sac-iliac jnt	✓	×	×	×
S135y	Other open #pelvis	×	✓	×	×
S135z	Othr/mlti opn # pelvis NOS	×	✓	×	×
S136	Clsd comp rupture pelvic ring	×	✓	×	×
S1360	Cls comp rupture pbc symphysis	×	✓	×	×
S1361	Cls comp rupture sac-ili jnt	✓	×	×	×
S137	Opn comp rupture pelvic ring	×	✓	×	×
S1370	Opn comp rupture pbc symphysis	×	✓	×	×
S1371	Opn comp rupture sac-iliac jnt	✓	×	×	×
S138	Traumat ruptur/symphysis pubis	×	✓	×	×
S13y	Closed #pelvis NOS	×	✓	×	×
S13z	Open #pelvis NOS	×	✓	×	×
S14	#Ill-defined bones of trunk	✓	×	×	×
S140	Closed #ill-defined trunk bone	✓	×	×	×
S141	Open #ill-defined trunk bone	✓	×	×	×

Read Code	Read Term	Axial	Lower Limb	Upper Limb	Clinician Defined	Read Code	Read Term	Axial	Lower Limb	Upper Limb	Clinician Defined
N02y6	Other crystal arth.-lower leg	×	✓	×	×	S14z	#Ill-defined trunk bone NOS	✓	×	×	×
N02y7	Other crystal arth.-ankle/foot	×	✓	×	×	S15	Fracture of thoracic vertebra	✓	×	×	×
N02z0	Crystal arthr.NOS-site unspec.	×	×	×	×	S150	Multi fractures/thoracic spine	✓	×	×	×
N02z1	Crystal arthr.NOS-shoulder	×	×	✓	×	S1500	Cl multi fractur of thor spine	✓	×	×	×
N02z2	Crystal arthr.NOS-upper arm	×	×	✓	×	S1501	Op multi fractur of thor spine	✓	×	×	×
N02z3	Crystal arthr.NOS-forearm	×	×	✓	×	S1z	Fracture of neck and trunk NOS	✓	×	×	×
N02z4	Crystal arthr.NOS-hand	×	×	✓	×	S2	Arm fracture	×	×	✓	×
N02z5	Crystal arthr.NOS-pelvic/thigh	×	✓	×	×	S20	#Clavicle	×	×	✓	×
N02z6	Crystal arthr.NOS-lower leg	×	✓	×	×	S200	Closed # clavicle	×	×	✓	×
N02z7	Crystal arthr.NOS-ankle/foot	×	✓	×	×	S2000	Closed #clavicle unspecified	×	×	✓	×
N02z8	Crys arthr NOS-shoulder	×	×	✓	×	S2001	Clsd # clavicle, medial end	×	×	✓	×
N02z9	Cryst arthr NOS-sternoclav jt	×	×	✓	×	S2002	Clsd # clavicle, shaft	×	×	✓	×
N02zA	Cryst arthr NOS-acromioclav jt	×	×	✓	×	S2003	Clsd # clavical, lateral end	×	×	✓	×
N02zB	Crystal arthropathy NOS-elbow	×	×	✓	×	S200z	Closed #clavicle NOS	×	×	✓	×
N02zC	Crys arthr NOS-dist rad-uln jt	×	×	✓	×	S201	Open # clavicle	×	×	✓	×
N02zD	Crystal arthropathy NOS-wrist	×	×	✓	×	S2010	Open #clavicle unspecified	×	×	✓	×
N02zE	Crystal arthropathy NOS-MCPJ	×	×	✓	×	S2011	Open # clavicle, medial end	×	×	✓	×
N02zF	Crystal arthrop NOS-PIPJ-fing	×	×	✓	×	S2012	Open fracture clavicle, shaft	×	×	✓	×
N02zG	Crystal arthrop NOS-DIPJ-fing	×	×	✓	×	S2013	Open # clavicle, lateral end	×	×	✓	×
N02zH	Crystal arthropathy NOS-hip	×	✓	×	×	S201z	Open #clavicle NOS	×	×	✓	×
N02zJ	Crystal arthropathy NOS-SIJ	✓	×	×	×	S20z	#Clavicle NOS	×	×	✓	×
N02zK	Crystal arthropathy NOS-knee	×	✓	×	×	S21	#Scapula	×	×	✓	×
N02zL	Cryst arthr NOS, tib-fib joint	×	✓	×	×	S210	Closed # scapula	×	×	✓	×
N02zM	Crystal arthropathy NOS-ankle	×	✓	×	×	S2100	Closed #scapula-unspecified	×	×	✓	×
N02zN	Cryst arthr NOS-subtalar joint	×	✓	×	×	S2101	Clsd # scapula, acromion	×	×	✓	×
N02zP	Crys arthr NOS-talonavic joint	×	✓	×	×	S2102	Clsd # scapula, coracoid	×	×	✓	×
N02zQ	Cryst arthr NOS-oth tarsal jt	×	✓	×	×	S2103	Clsd # scapula, glenoid	×	×	✓	×
N02zR	Cryst arthr NOS-1st MTPJ	×	✓	×	×	S2104	Closed fracture scapula, blade	×	×	✓	×
N02zS	Cryst arthr NOS-lesser MTPJ	×	✓	×	×	S2105	Closed fracture scapula, spine	×	×	✓	×
N02zT	Crystal arthrop NOS-IPJ of toe	×	✓	×	×	S2106	Closed fracture scapula, neck	×	×	✓	×
N03x0	Arthr assoc oth dis-shoulder	×	×	✓	×	S210z	Closed #scapula NOS	×	×	✓	×
N03x1	Arthr ass oth dis-sternoclav j	×	×	✓	×	S211	Open # scapula	×	×	✓	×
N03x2	Arthr ass oth dis-acromioclv j	×	×	✓	×	S2110	Open #scapula-unspecified	×	×	✓	×
N03x3	Arthr assoc oth dis-elbow	×	×	✓	×	S2111	Open # scapula, acromion	×	×	✓	×
N03x4	Arthr assoc oth dis-dist RUJ	×	×	✓	×	S2112	Open # scapula, coracoid	×	×	✓	×
N03x5	Arthr assoc oth dis-wrist	×	×	✓	×	S2113	Open fracture scapula, glenoid	×	×	✓	×
N03x6	Arthr assoc oth dis-MCPJ	×	×	✓	×	S2114	Open fracture scapula, blade	×	×	✓	×
N03x7	Arthr assoc oth dis-PIPJ-fing	×	×	✓	×	S2115	Open fracture scapula, spine	×	×	✓	×
N03x8	Arthr assoc oth dis-DIPJ-fing	×	×	✓	×	S2116	Open fracture scapula, neck	×	×	✓	×
N03x9	Arthr assoc oth dis-hip	×	✓	×	×	S211z	Open #scapula NOS	×	×	✓	×
N03xA	Arthr assoc oth dis-SIJ	✓	×	×	×	S21z	#Scapula NOS	×	×	✓	×
N03xB	Arthr assoc oth dis-knee	×	✓	×	×	S22	#Humerus	×	×	✓	×
N03xC	Arthr assoc oth dis, tib-fib j	×	✓	×	×	S220	Clsd # proximal humerus	×	×	✓	×
N03xD	Arthr assoc oth dis-ankle	×	✓	×	×	S2200	Cls # proxim humerus unsp part	×	×	✓	×

Read Code	Read Term	Axial	Lower Limb	Upper Limb	Clinician Defined	Read Code	Read Term	Axial	Lower Limb	Upper Limb	Clinician Defined
N03xE	Arthr assoc oth dis-subtalar j	×	✓	×	×	S2201	Clsd # proxim humerus, neck	×	×	✓	×
N03xF	Arthr assoc oth dis-talonav jt	×	✓	×	×	S2202	Cls # prxm humerus,anatom neck	×	×	✓	×
N03xG	Arthr assoc oth dis-oth tars j	×	✓	×	×	S2203	Clsd # prxm hmrs,grtr tubrsity	×	×	✓	×
N03xH	Arthr assoc oth dis-1st MTPJ	×	✓	×	×	S2204	Clsd # proxim humerus,head	×	×	✓	×
N03xJ	Arthr assoc oth dis-less MTPJ	×	✓	×	×	S2205	Closed #humerus-upper epiphys.	×	×	✓	×
N03xK	Arthr assoc oth dis-IPJ of toe	×	✓	×	×	S2206	Cls # prxm humerus,three part	×	×	✓	×
N0400	Rheumatoid arthritis-Cx spine	✓	×	×	×	S2207	Cls # prxm humerus,four part	×	×	✓	×
N0401	Oth rheumatoid arthritis-spine	✓	×	×	×	S220z	Clsd # proxim humerus NOS	×	×	✓	×
N0402	Rheumatoid arthritis-shoulder	×	×	✓	×	S221	Shoulder fracture - open	×	×	✓	×
N0403	Rheumatoid arthr-sternoclav jt	×	×	✓	×	S2210	Opn # proxim humerus unsp part	×	×	✓	×
N0404	Rheumatoid arthr-acromioclav j	×	×	✓	×	S2211	Opn # proxim humerus, neck	×	×	✓	×
N0405	Rheumatoid arthritis of elbow	×	×	✓	×	S2212	Opn # prxm humerus,anatom neck	×	×	✓	×
N0406	Rheumatoid arthritis-dist RUJ	×	×	✓	×	S2213	Opn # prxm hmrs,grtr tubrsity	×	×	✓	×
N0407	Rheumatoid arthritis of wrist	×	×	✓	×	S2214	Opn # proxim humerus,head	×	×	✓	×
N0408	Rheumatoid arthritis-MCP joint	×	×	✓	×	S2215	Open #humerus-upper epiphysis	×	×	✓	×
N0409	Rheumatoid arthritis-PIPJ-fing	×	×	✓	×	S2216	Opn # prxm humerus,three part	×	×	✓	×
N040A	Rheumatoid arthritis-DIPJ-fing	×	×	✓	×	S2217	Opn # prxm humerus,four part	×	×	✓	×
N040B	Rheumatoid arthritis of hip	×	✓	×	×	S221z	Opn # proxim humerus NOS	×	×	✓	×
N040C	Rheumatoid arthritis of SIJ	✓	×	×	×	S222	Closed #humerus-shaft/unspec.	×	×	✓	×
N040D	Rheumatoid arthritis of knee	×	✓	×	×	S2220	Closed # humerus NOS	×	×	✓	×
N040E	Rheumatoid arthr of tib-fib jt	×	✓	×	×	S2221	Closed # humerus-shaft	×	×	✓	×
N040F	Rheumatoid arthritis of ankle	×	✓	×	×	S222z	Closed #humerus-shaft/unsp.NOS	×	×	✓	×
N040G	Rheumatoid arthr-subtalar jnt	×	✓	×	×	S223	Open #humerus-shaft/unspecif.	×	×	✓	×
N040H	Rheumatoid arthr-talonav joint	×	✓	×	×	S2230	Open # humerus NOS	×	×	✓	×
N040J	Rheumatoid arthr-oth tarsal jt	×	✓	×	×	S2231	Open # humerus-shaft	×	×	✓	×
N040K	Rheumatoid arthr-1st MTP joint	×	✓	×	×	S223z	Open #humerus shaft/unspec.NOS	×	×	✓	×
N040L	Rheumatoid arthr-lesser MTP jt	×	✓	×	×	S224	Clsd # distal humerus	×	×	✓	×
N040M	Rheumatoid arthr-IP joint-toe	×	✓	×	×	S2240	Closed # elbow unspecified	×	×	✓	×
N0433	Monarticular juvenile R.A.	×	×	×	×	S2241	Cls # dist humrs,supracondylar	×	×	✓	×
N0450	Juv ankylosing spondylitis	✓	×	×	×	S2242	Cls # dist humerus,lat condyle	×	×	✓	×
N0501	Generalised OA-hand	×	×	✓	✓	S2243	Cls # dist humerus,med condyle	×	×	✓	×
N0503	Bouchard's nodes with arthrop	×	×	✓	×	S2244	Cls # dist humrs,condyle(unsp)	×	×	✓	×
N0507	Heberden's nodes + arthropathy	×	×	✓	×	S2245	Cls # dist humerus, trochlea	×	×	✓	×
N051	Local.primary osteoarthritis	×	×	×	✓	S2246	Cls # dist hmrs,lat epicondyle	×	×	✓	×
N0510	Local.primary OA-site unspec.	×	×	×	✓	S2247	Cls # dist hmrs,med epicondyle	×	×	✓	×
N0511	Local.primary OA-shoulder regn	×	×	✓	✓	S2248	Cls # dist humerus,capitellum	×	×	✓	×
N0512	Local.primary OA-upper arm	×	×	✓	✓	S2249	Cls # dist hmrs,bicond(T-Y #)	×	×	✓	×
N0513	Local.primary OA-forearm	×	×	✓	✓	S224x	Cls # dist humerus,multi	×	×	✓	×
N0514	Local.primary OA-hand	×	×	✓	✓	S224z	Cls # dist humerus NOS	×	×	✓	×
N0515	Local.primary OA-pelvic/thigh	×	✓	×	✓	S225	Elbow fracture - open	×	×	✓	×
N0516	Local.primary OA-lower leg	×	✓	×	✓	S2250	Open #elbow unspecified	×	×	✓	×
N0517	Local.primary OA-ankle/foot	×	✓	×	✓	S2251	Opn # dist humrs,supracondylar	×	×	✓	×
N0518	Local.primary OA-other specif	×	×	×	✓	S2252	Opn # dist humerus,lat condyle	×	×	✓	×
N0519	Primary coxarthrosis, bilat	×	✓	×	✓	S2253	Opn # dist humerus,med condyle	×	×	✓	×

Read Code	Read Term	Axial	Lower Limb	Upper Limb	Clinician Defined	Read Code	Read Term	Axial	Lower Limb	Upper Limb	Clinician Defined
N051A	Coxarthr from dysplasia, bilat	×	✓	×	✓	S2254	Opn # dist humrs,condyle(unsp)	×	×	✓	×
N051B	Primary gonarthrosis, bilat	×	✓	×	✓	S2255	Opn # dist humerus, trochlea	×	×	✓	×
N051C	Pr arth 1st carpometcp jts,bil	×	×	✓	✓	S2256	Opn # dist hmrs,lat epicondyle	×	×	✓	×
N051D	Local prim osteoarth wrist	×	×	✓	✓	S2257	Opn # dist hmrs,med epicondyle	×	×	✓	×
N051E	Local prim osteoarth toe	×	✓	×	✓	S2258	Opn # dist humerus,capitellum	×	×	✓	×
N051F	Local prim osteoarth elbow	×	×	✓	✓	S2259	Opn # dist hmrs,bicond(T-Y #)	×	×	✓	×
N051z	Localised primary OA NOS	×	×	×	✓	S225x	Opn # dist humerus,multi	×	×	✓	×
N052	Local.secondary osteoarthritis	×	×	×	✓	S225z	Opn # dist humerus NOS	×	×	✓	×
N0520	Local.secondary OA-site unsp.	×	×	×	✓	S226	Fracture/upper end of humerus	×	×	✓	×
N0521	Local.secondary OA-shoulder	×	×	✓	✓	S227	Fracture of shaft of humerus	×	×	✓	×
N0522	Local.secondary OA-upper arm	×	×	✓	✓	S228	Fracture/lower end of humerus	×	×	✓	×
N0523	Local.secondary OA-forearm	×	×	✓	✓	S22z	Fracture of humerus NOS	×	×	✓	×
N0524	Local.secondary OA-hand	×	×	✓	✓	S23	#Radius and ulna	×	×	✓	×
N0525	Local.secondary OA-pelv./thigh	×	✓	×	✓	S230	Cls # prox radius + ulna	×	×	✓	×
N0526	Local.secondary OA-lower leg	×	✓	×	✓	S2300	Clsd # prox forearm unsp part	×	×	✓	×
N0527	Local.secondary OA-ankle/foot	×	✓	×	✓	S2301	Clsd # olecranon,extra-articlr	×	×	✓	×
N0528	Local.secondary OA-other spec.	×	×	×	✓	S2302	Clsd # ulna, coronoid	×	×	✓	×
N0529	Post-traum coxarthrosis, bilat	×	✓	×	✓	S2303	Closed Monteggia's fracture	×	×	✓	×
N052A	Post-traum gonarthrosis, bilat	×	✓	×	✓	S2304	Clsd # prox ulna, comminuted	×	×	✓	×
N052B	Pst-tr art 1 carpometcp jt bil	×	×	✓	✓	S2305	Clsd # proximal ulna	×	×	✓	×
N052C	Post-trauma gonarth, unilat	×	✓	×	✓	S2306	Closed fracture radius head	×	×	✓	×
N052z	Localised secondary OA NOS	×	×	×	✓	S2307	Closed fracture radius, neck	×	×	✓	×
N053	Localised OA unspecified	×	×	×	✓	S2308	Clsd # prox radius, comminuted	×	×	✓	×
N0530	Local.OA unsp.-site unspecif.	×	×	×	✓	S2309	Clsd # proximal radius	×	×	✓	×
N0531	Local.OA unsp.-shoulder region	×	×	✓	✓	S230A	Clsd # radius+ulna, proximal	×	×	✓	×
N0532	Local.OA unsp.-upper arm	×	×	✓	✓	S230B	Clsd # olecranon,intra-articlr	×	×	✓	×
N0533	Local.OA unsp.-forearm	×	×	✓	✓	S230z	Clsd # proximal forearm NOS	×	×	✓	×
N0534	Local.OA unsp.-hand	×	×	✓	✓	S231	Opn # proximal radius+ulna	×	×	✓	×
N0535	Hip osteoarthitis NOS	×	✓	×	✓	S2310	Opn # proximal forearm, unsp	×	×	✓	×
N0536	Local.OA unsp.-lower leg	×	✓	×	✓	S2311	Opn # olecranon,extra-artclr	×	×	✓	×
N0537	Local.OA unsp.-ankle/foot	×	✓	×	✓	S2312	Opn # ulna, coronoid	×	×	✓	×
N0538	Local.OA unsp.-other specified	×	×	×	✓	S2313	Open Monteggia's fracture	×	×	✓	×
N0539	Arthros 1st CMC joint, unspec	×	×	✓	✓	S2314	Opn # prox ulna, comminuted	×	×	✓	×
N053z	Localised OA unspecified NOS	×	×	×	✓	S2315	Open # proximal ulna	×	×	✓	×
N054	Oligoarticular OA, unspecified	×	×	×	✓	S2316	Open fracture radial head	×	×	✓	×
N0540	Oligoartic OA, unsp-unsp sites	×	×	×	✓	S2317	Open fracture radial neck	×	×	✓	×
N0541	Oligoartic OA, unspec-shoulder	×	×	✓	✓	S2318	Open # prox radius,comminuted	×	×	✓	×
N0542	Oligoartic OA, unspec-upp arm	×	×	✓	✓	S2319	Opn # proximal radius	×	×	✓	×
N0543	Oligoartic OA, unspec-forearm	×	×	✓	✓	S231A	Opn # radius+ulna,proximal	×	×	✓	×
N0544	Oligoartic OA, unspec-hand	×	×	✓	✓	S231B	Opn # olecranon,intra-artclr	×	×	✓	×
N0545	Oligoartic OA, unspec-pelv/thi	×	✓	×	✓	S231z	Open #forearm-upper end NOS	×	×	✓	×
N0546	Oligoartic OA, unspec-leg	×	✓	×	✓	S232	Closed #radius/ulna-shaft	×	×	✓	×
N0547	Oligoartic OA, unspec-ank/foot	×	✓	×	✓	S2320	Closed #radius-shaft unspecif.	×	×	✓	×
N0548	Oligoartic OA, unspec-oth site	×	×	×	✓	S2321	Closed # radial shaft	×	×	✓	×

Read Code	Read Term	Axial	Lower Limb	Upper Limb	Clinician Defined	Read Code	Read Term	Axial	Lower Limb	Upper Limb	Clinician Defined
N054z	OA,1 site +,unspecified NOS	×	×	×	✓	S2322	Closed # ulnar shaft	×	×	✓	×
N05z0	Osteoarthritis NOS-site unspec	×	×	×	✓	S2323	Clsd # radius + ulna, middle	×	×	✓	×
N05z1	Osteoarthritis NOS-shoulder	×	×	✓	✓	S232z	Closed #radius/ulna shaft NOS	×	×	✓	×
N05z2	Elbow osteoarthritis NOS	×	×	✓	✓	S233	Open #radius/ulna-shaft	×	×	✓	×
N05z3	Osteoarthritis NOS of the forearm	×	×	✓	✓	S2330	Open #radius-shaft unspecified	×	×	✓	×
N05z4	Finger osteoarthritis NOS	×	×	✓	✓	S2331	Open # radial shaft	×	×	✓	×
N05z5	Hip osteoarthritis NOS	×	✓	×	✓	S2332	Open # ulnar shaft	×	×	✓	×
N05z6	Knee osteoarthritis NOS	×	✓	×	✓	S2333	Open # radius+ulna, middle	×	×	✓	×
N05z7	Ankle osteoarthritis NOS	×	✓	×	✓	S233z	Open #radius/ulna shaft NOS	×	×	✓	×
N05z9	Osteoarthritis NOS, shoulder	×	×	✓	✓	S234	Closed #radius/ulna-lower end	×	×	✓	×
N05zA	OA NOS-sternoclavicular joint	×	×	✓	✓	S2340	Closed #forearm-lower end unsp	×	×	✓	×
N05zB	OA NOS-acromioclavicular joint	×	×	✓	✓	S2341	Closed Colles fracture	×	×	✓	×
N05zC	OA NOS-elbow	×	×	✓	✓	S2342	Clsd # distal radius unspec	×	×	✓	×
N05zD	OA NOS-dist radio-ulnar joint	×	×	✓	✓	S2343	Closed #ulna-styloid process	×	×	✓	×
N05zE	OA NOS-wrist	×	×	✓	✓	S2344	Closed #ulna-lower epiphysis	×	×	✓	×
N05zF	OA NOS-MCP joint	×	×	✓	✓	S2345	Closed fract dist ulna,unspec	×	×	✓	×
N05zG	OA NOS-PIP joint of finger	×	×	✓	✓	S2346	Clsd # radius+ulna, distal	×	×	✓	×
N05zH	OA NOS-DIP joint of finger	×	×	✓	✓	S2347	Closed Smith's fracture	×	×	✓	×
N05zJ	OA NOS-hip	×	✓	×	✓	S2348	Closed Galeazzi fracture	×	×	✓	×
N05zK	OA NOS-SI joint	✓	×	×	✓	S2349	Closed volar Barton's fracture	×	×	✓	×
N05zL	Osteoarthritis NOS of knee	×	✓	×	✓	S234A	Closd dorsal Barton's fracture	×	×	✓	×
N05zM	OA NOS tibio-fibular joint	×	✓	×	✓	S234B	Closed fracture radial styloid	×	×	✓	×
N05zN	OA NOS-ankle	×	✓	×	✓	S234C	Cl # dist rad,int-art,die-pnch	×	×	✓	×
N05zP	OA NOS-subtalar joint	×	✓	×	✓	S234D	Cl # dist rad,ext-art,oth type	×	×	✓	×
N05zQ	OA NOS-talonavicular joint	×	✓	×	✓	S234E	Cl # dist rad,int-art,oth type	×	×	✓	×
N05zR	OA NOS-other tarsal joint	×	✓	×	✓	S234F	Closed Barton's fracture	×	×	✓	×
N05zS	OA NOS-1st MTP joint	×	✓	×	✓	S234z	Closed #forearm-lower end NOS	×	×	✓	×
N05zT	OA NOS-lesser MTP joint	×	✓	×	✓	S235	Wrist fracture - open	×	×	✓	×
N05zU	OA NOS-IP joint of toe	×	✓	×	✓	S2350	Open #forearm-lower end unsp.	×	×	✓	×
N0600	Kaschin-Beck dis.-site unspec.	×	×	×	×	S2351	Smith's fracture - open	×	×	✓	×
N0601	Kaschin-Beck dis.-shoulder	×	×	✓	×	S2352	Opn # distal radius, unspec	×	×	✓	×
N0602	Kaschin-Beck dis.-upper arm	×	×	✓	×	S2353	Open #ulna-styloid process	×	×	✓	×
N0603	Kaschin-Beck dis.-forearm	×	×	✓	×	S2354	Open #ulna-lower epiphysis	×	×	✓	×
N0604	Kaschin-Beck dis.-hand	×	×	✓	×	S2355	Opn # distal ulna - other	×	×	✓	×
N0605	Kaschin-Beck dis.-pelvic/thigh	×	✓	×	×	S2356	Opn # radius + ulna, distal	×	×	✓	×
N0606	Kaschin-Beck dis.-lower leg	×	✓	×	×	S2357	Open Smith's fracture	×	×	✓	×
N0607	Kaschin-Beck dis.-ankle/foot	×	✓	×	×	S2358	Open Galeazzi fracture	×	×	✓	×
N0610	Traumatic arthr.-site unspecif	×	×	×	×	S2359	Open volar Barton's fracture	×	×	✓	×
N0611	Traumatic arthr.-shoulder	×	×	✓	×	S235A	Open dorsal Barton's fracture	×	×	✓	×
N0612	Traumatic arthr.-upper arm	×	×	✓	×	S235B	Open fracture radial styloid	×	×	✓	×
N0613	Traumatic arthr.-forearm	×	×	✓	×	S235C	Op # dist rad,int-art,die-pnch	×	×	✓	×
N0614	Traumatic arthr.-hand	×	×	✓	×	S235D	Op # dist rad,ext-art oth type	×	×	✓	×
N0615	Traumatic arthr.-pelvic/thigh	×	✓	×	×	S235E	Op # dist rad,int-art oth type	×	×	✓	×
N0616	Traumatic arthr.-lower leg	×	✓	×	×	S235F	Open Barton's fracture	×	×	✓	×

Read Code	Read Term	Axial	Lower Limb	Upper Limb	Clinician Defined	Read Code	Read Term	Axial	Lower Limb	Upper Limb	Clinician Defined
N0617	Traumatic arthr.-ankle/foot	×	✓	×	×	S235z	Open #forearm-lower end NOS	×	×	✓	×
N061A	Traumatic arthropathy-shoulder	×	×	✓	×	S236	Fracture of upper end of ulna	×	×	✓	×
N061B	Traumat arthrop-sternoclav jt	×	×	✓	×	S237	Fracture/upper end of radius	×	×	✓	×
N061C	Traumat arthrop-acromioclav jt	×	×	✓	×	S238	Fracture of shaft of ulna	×	×	✓	×
N061D	Traumatic arthropathy-elbow	×	×	✓	×	S239	Fracture of shaft of radius	×	×	✓	×
N061E	Traumatic arthropathy-dist RUJ	×	×	✓	×	S23A	Fractur/shaft/both ulna+radius	×	×	✓	×
N061F	Traumatic arthropathy-wrist	×	×	✓	×	S23B	Fracture / lower end of radius	×	×	✓	×
N061G	Traumatic arthropathy-MCPJ	×	×	✓	×	S23C	Fractr/lw end/both ulna+radius	×	×	✓	×
N061H	Traumatic arthrop-PIPJ-fing	×	×	✓	×	S23x	Closed #radius/ulna unspecif.	×	×	✓	×
N061J	Traumatic arthrop-DIPJ-fing	×	×	✓	×	S23x0	Closed #forearm unspecified	×	×	✓	×
N061K	Traumatic arthropathy-hip	×	✓	×	×	S23x1	Closed #radius alone unspecif.	×	×	✓	×
N061L	Traumatic arthropathy-SIJ	✓	×	×	×	S23x2	Fracture of ulna NOS	×	×	✓	×
N061M	Traumatic arthropathy-knee	×	✓	×	×	S23x3	Clsd # radius + ulna	×	×	✓	×
N061N	Traumatic arthrop, tib-fib jnt	×	✓	×	×	S23xz	Closed #radius/ulna NOS	×	×	✓	×
N061P	Traumatic arthropathy-ankle	×	✓	×	×	S23y	Open #radius/ulna unspecified	×	×	✓	×
N061Q	Traumatic arthrop-subtalar jnt	×	✓	×	×	S23y0	Open #forearm unspecified	×	×	✓	×
N061R	Traumatic arthrop-talonav jnt	×	✓	×	×	S23y1	Open #radius alone unspecified	×	×	✓	×
N061S	Traumatic arthrop-oth tars jnt	×	✓	×	×	S23y2	Open #ulna alone unspecified	×	×	✓	×
N061T	Traumatic arthropathy-1st MTPJ	×	✓	×	×	S23y3	Opn # radius + ulna	×	×	✓	×
N061U	Traumatic arthrop-less MTPJ	×	✓	×	×	S23yz	Open #radius/ulna NOS	×	×	✓	×
N061V	Traumatic arthropathy-IPJ-toe	×	✓	×	×	S23z	#Radius/ulna NOS	×	×	✓	×
N0620	Allergic arthritis-site unsp.	×	×	×	×	S24	Hand fracture - carpal bone	×	×	✓	×
N0621	Allergic arthritis-shoulder	×	×	✓	×	S240	Closed #carpal bone	×	×	✓	×
N0622	Allergic arthritis-upper arm	×	×	✓	×	S2400	Closed #carpal bone unspecif.	×	×	✓	×
N0623	Allergic arthritis-forearm	×	×	✓	×	S2401	Closed fracture of the scaphoid	×	×	✓	×
N0624	Allergic arthritis-hand	×	×	✓	×	S2402	Closed fracture lunate	×	×	✓	×
N0625	Allergic arthritis-pelv./thigh	×	✓	×	×	S2403	Closed fracture triquetral	×	×	✓	×
N0626	Allergic arthritis-lower leg	×	✓	×	×	S2404	Closed fracture pisiform	×	×	✓	×
N0627	Allergic arthritis-ankle/foot	×	✓	×	×	S2405	Closed fracture trapezium	×	×	✓	×
N0630	Climacteric arthr.-site unsp.	×	×	×	✓	S2406	Closed fracture trapezoid	×	×	✓	×
N0631	Climacteric arthr.-shoulder	×	×	✓	✓	S2407	Closed fracture capitate	×	×	✓	×
N0632	Climacteric arthr.-upper arm	×	×	✓	✓	S2408	Closed fracture hamate	×	×	✓	×
N0633	Climacteric arthr.-forearm	×	×	✓	✓	S2409	Closed fracture hamate, hook	×	×	✓	×
N0634	Climacteric arthr.-hand	×	×	✓	✓	S240A	Cls # scaphoid, prox pole	×	×	✓	×
N0635	Climacteric arthr.-pelv./thigh	×	✓	×	✓	S240B	Cls # scaphoid,waist,transv	×	×	✓	×
N0636	Climacteric arthr.-lower leg	×	✓	×	✓	S240C	Cls # scaphoid,waist,oblique	×	×	✓	×
N0637	Climacteric arthr.-ankle/foot	×	✓	×	✓	S240D	Cls # scaphoid,waist,commintd	×	×	✓	×
N0640	Transient arthr.-site unspecif	×	×	×	✓	S240E	Cls # scaphoid, tuberosity	×	×	✓	×
N0641	Transient arthr.-shoulder	×	×	✓	✓	S240F	Cls # carpal bones, multiple	×	×	✓	×
N0642	Transient arthr.-upper arm	×	×	✓	✓	S240y	Closed #other carpal bone	×	×	✓	×
N0643	Transient arthr.-forearm	×	×	✓	✓	S240z	Closed #carpal bone NOS	×	×	✓	×
N0644	Transient arthr.-hand	×	×	✓	✓	S241	Open #carpal bone	×	×	✓	×
N0645	Transient arthr.-pelvic/thigh	×	✓	×	✓	S2410	Open #carpal bone unspecified	×	×	✓	×
N0646	Transient arthr.-lower leg	×	✓	×	✓	S2411	Open fracture of the scaphoid	×	×	✓	×

Read Code	Read Term	Axial	Lower Limb	Upper Limb	Clinician Defined
N0647	Transient arthr.-ankle/foot	×	✓	×	✓
N064A	Transient arthropathy-shoulder	×	×	✓	✓
N064B	Transient arthrop-sternoclav j	×	×	✓	✓
N064C	Transient arthr-acromioclav jt	×	×	✓	✓
N064D	Transient arthropathy-elbow	×	×	✓	✓
N064E	Transient arthropathy-dist RUJ	×	×	✓	✓
N064F	Transient arthropathy-wrist	×	×	✓	✓
N064G	Transient arthropathy-MCPJ	×	×	✓	✓
N064H	Transient arthrop-PIPJ-fing	×	×	✓	✓
N064J	Transient arthrop-DIPJ-fing	×	×	✓	✓
N064K	Transient arthropathy-hip	×	✓	×	✓
N064L	Transient arthropathy-SIJ	✓	×	×	✓
N064M	Transient arthropathy-knee	×	✓	×	✓
N064N	Transient arthrop, tib-fib jnt	×	✓	×	✓
N064P	Transient arthropathy-ankle	×	✓	×	✓
N064Q	Transient arthrop-subtalar jnt	×	✓	×	✓
N064R	Transient arthrop-talonav jnt	×	✓	×	✓
N064S	Transient arthrop-oth tars jnt	×	✓	×	✓
N064T	Transient arthropathy-1st MTPJ	×	✓	×	✓
N064U	Transient arthrop-less MTPJ	×	✓	×	✓
N064V	Transient arthropathy-IPJ-toe	×	✓	×	✓
N0651	Unsp.polyarthr.-shoulder	×	×	✓	✓
N0652	Unsp.polyarthr.-upper arm	×	×	✓	✓
N0653	Unsp.polyarthr.-forearm	×	×	✓	✓
N0654	Unsp.polyarthr.-hand	×	×	✓	✓
N0655	Unsp.polyarthr.-pelvic/thigh	×	✓	×	✓
N0656	Unsp.polyarthr.-lower leg	×	✓	×	✓
N0657	Unsp.polyarthr.-ankle/foot	×	✓	×	✓
N066	Unspecified monoarthritis	×	×	×	✓
N0660	Unsp.monoarthr.-site unspecif.	×	×	×	✓
N0661	Unsp.monoarthr.-shoulder	×	×	✓	✓
N0662	Unsp.monoarthr.-upper arm	×	×	✓	✓
N0663	Unsp.monoarthr.-forearm	×	×	✓	✓
N0664	Unsp.monoarthr.-hand	×	×	✓	✓
N0665	Unsp.monoarthr.-pelvic/thigh	×	✓	×	✓
N0666	Unsp.monoarthr.-lower leg	×	✓	×	✓
N0667	Unsp.monoarthr.-ankle/foot	×	✓	×	✓
N0668	Unsp.monoarthr.-other specif.	×	×	×	✓
N066z	Unspecified monoarthritis NOS	×	×	×	✓
N06y0	Other spec.arthr.-site unspec.	×	×	×	✓
N06y1	Other spec.arthr.-shoulder	×	×	✓	✓
N06y2	Other spec.arthr.-upper arm	×	×	✓	✓
N06y3	Other spec.arthr.-forearm	×	×	✓	✓
N06y4	Other spec.arthr.-hand	×	×	✓	✓
S2412	Open fracture lunate	×	×	✓	×
S2413	Open fracture triquetral	×	×	✓	×
S2414	Open fracture pisiform	×	×	✓	×
S2415	Open fracture trapezium	×	×	✓	×
S2416	Open fracture trapezoid	×	×	✓	×
S2417	Open fracture capitate	×	×	✓	×
S2418	Open fracture hamate	×	×	✓	×
S2419	Open fracture hamate, hook	×	×	✓	×
S241A	Opn # scaphoid, proxim pole	×	×	✓	×
S241B	Opn # scaphoid,waist,transv	×	×	✓	×
S241C	Opn # scaphoid,waist,oblique	×	×	✓	×
S241D	Opn # scaphoid,waist,commintd	×	×	✓	×
S241E	Opn # scaphoid, tuberosity	×	×	✓	×
S241F	Opn # carpal bones, multiple	×	×	✓	×
S241y	Open #other carpal bone	×	×	✓	×
S241z	Open #carpal bone NOS	×	×	✓	×
S242	Fracture at wrist and hand level	×	×	✓	×
S2420	Fracture of scaphoid	×	×	✓	×
S2421	Fracture/1st metacarpal bone	×	×	✓	×
S2422	Fracture of other metacarpal bone	×	×	✓	×
S2423	Mult fracture/metacarpal bones	×	×	✓	×
S24z	#Carpal bone NOS	×	×	✓	×
S25	#Metacarpal bone	×	×	✓	×
S250	Closed #metacarpal bone	×	×	✓	×
S2500	Closed #metacarpal bone unsp.	×	×	✓	×
S2501	Cls # thmb mtcarp base Bennett	×	×	✓	×
S2502	Cls # finger metacarp base	×	×	✓	×
S2503	Cls # finger metacarp shaft	×	×	✓	×
S2504	Cls # finger metacarp neck	×	×	✓	×
S2505	Cls # finger metacarp head	×	×	✓	×
S2506	Closed fracture finger metacarpal	×	×	✓	×
S2507	Cls # finger metacarp, multi	×	×	✓	×
S2508	Cls # thumb metacarpal	×	×	✓	×
S2509	Cls # thmb mtcarp base Rolando	×	×	✓	×
S250A	Cls # thumb metacarpal shaft	×	×	✓	×
S250B	Cls # thumb metacarpal neck	×	×	✓	×
S250C	Cls # thumb metacarpal head	×	×	✓	×
S250x	Cls # mlti sites unsp mtcarpus	×	×	✓	×
S250z	Closed #metacarpal bone NOS	×	×	✓	×
S251	Open #metacarpal bone	×	×	✓	×
S2510	Open #metacarpal bone unspec.	×	×	✓	×
S2511	Op # thmb mtcarp base Bennett	×	×	✓	×
S2512	Opn # finger mtcarpal base	×	×	✓	×
S2513	Opn # finger metacarpal shaft	×	×	✓	×

Read Code	Read Term	Axial	Lower Limb	Upper Limb	Clinician Defined
N06y5	Other spec.arthr.-pelvic/thigh	×	✓	×	✓
N06y6	Other spec.arthr.-lower leg	×	✓	×	✓
N06y7	Other spec.arthr.-ankle/foot	×	✓	×	✓
N06z0	Arthropathy NOS-site unspecif.	×	×	×	✓
N06z1	Shoulder arthritis NOS	×	×	✓	✓
N06z2	Arthropathy NOS-upper arm	×	×	✓	✓
N06z3	Arthropathy NOS-forearm	×	×	✓	✓
N06z4	Arthropathy NOS of the hand	×	×	✓	✓
N06z5	Hip arthritis NOS	×	✓	×	✓
N06z6	Knee arthritis NOS	×	✓	×	✓
N06z7	Ankle arthritis NOS	×	✓	×	✓
N07	Internal derangement of knee	×	✓	×	×
N070	Medial meniscus derangement	×	✓	×	×
N0700	Medial menisc.derang.unspecif	×	✓	×	×
N0701	Old bucket handle tear-medial	×	✓	×	×
N0702	Medial menisc.ant.horn derang.	×	✓	×	×
N0703	Medial menisc.post.horn derang	×	✓	×	×
N0704	Parr beak tear-post/med menisc	×	✓	×	×
N0705	Periph detach-medial meniscus	×	✓	×	×
N0706	Radial tear of medial meniscus	×	✓	×	×
N0707	Horiz cleavage tear-med menisc	×	✓	×	×
N0708	Multiple tears-medial meniscus	×	✓	×	×
N0709	Cyst of medial meniscus	×	✓	×	×
N070A	Old tear of medial meniscus	×	✓	×	×
N070B	Old tear post horn med menis	×	✓	×	×
N070z	Medial meniscus derange.NOS	×	✓	×	×
N071	Lateral meniscus derangement	×	✓	×	×
N0710	Lateral menisc.derang.unspecif	×	✓	×	×
N0711	Old bucket handle tear-lat men	×	✓	×	×
N0712	Lateral menisc.ant.horn derang	×	✓	×	×
N0713	Lateral menisc.post.horn deran	×	✓	×	×
N0714	Lateral meniscus derangem.NOS	×	✓	×	×
N0715	Parr beak tear-post/lat menisc	×	✓	×	×
N0716	Periph detach-lateral meniscus	×	✓	×	×
N0717	Radial tear-lateral meniscus	×	✓	×	×
N0718	Horiz cleavage tear-lat menisc	×	✓	×	×
N0719	Multiple tears-lat meniscus	×	✓	×	×
N071A	Cyst of lateral meniscus	×	✓	×	×
N071B	Discoid lateral meniscus	×	✓	×	×
N071C	Old tear of lateral meniscus	×	✓	×	×
N072	Meniscus derangement NEC	×	✓	×	×
N0720	Old torn meniscus of knee	×	✓	×	×
N0721	Degen lesion artic cart knee	×	✓	×	×
N0722	Cyst of semilunar cartilage	×	✓	×	×
S2514	Opn # finger metacarpal neck	×	×	✓	×
S2515	Opn # finger metacarpal head	×	×	✓	×
S2516	Opn fracture finger metacarpal	×	×	✓	×
S2517	Opn # finger metacarpal, multi	×	×	✓	×
S2518	Open # thumb metacarpal	×	×	✓	×
S2519	Op # thmb mtcarp base Rolando	×	×	✓	×
S251A	Opn # thumb metacarpal shaft	×	×	✓	×
S251B	Opn # thumb metacarpal neck	×	×	✓	×
S251C	Opn # thumb metacarpal head	×	×	✓	×
S251x	Opn # multi sites unsp mtcrpus	×	×	✓	×
S251z	Open #metacarpal bone NOS	×	×	✓	×
S252	Clsd # sesamoid bone hand	×	×	✓	×
S253	Opn # sesamoid bone hand	×	×	✓	×
S26	#Phalanges of hand	×	×	✓	×
S260	Closed #phalanges of hand	×	×	✓	×
S2600	Closed #palanges of hand unsp.	×	×	✓	×
S2601	Cl # md/prx phln/phlns,unsp pt	×	×	✓	×
S2602	Cls # dstl phlnx/ges unsp part	×	×	✓	×
S2603	Cls # thumb proximal phalanx	×	×	✓	×
S2604	Cls # thumb prox phalanx,base	×	×	✓	×
S2605	Cls # thumb prox phalnx,shaft	×	×	✓	×
S2606	Cls # thumb prox phalanx,neck	×	×	✓	×
S2607	Cls # thumb prox phalanx,head	×	×	✓	×
S2608	Cls # thumb distal phalanx	×	×	✓	×
S2609	Cls # thumb dist phalanx, base	×	×	✓	×
S260A	Cls # thumb dist phalanx,shaft	×	×	✓	×
S260B	Cls # thumb distl phalanx,tuft	×	×	✓	×
S260C	Cls # thumb dist phlnx,mallet	×	×	✓	×
S260D	Cls # finger proximal phalanx	×	×	✓	×
S260E	Cls # finger prox phlanx,base	×	×	✓	×
S260F	Cls # finger prox phlnx,shaft	×	×	✓	×
S260G	Cls # finger prox phlnx neck	×	×	✓	×
S260H	Cls # finger prox phlnx,head	×	×	✓	×
S260J	Cls # finger prox phlnx,mlti	×	×	✓	×
S260K	Cls # finger middle phalanx	×	×	✓	×
S260L	Cls # finger mid phalanx,base	×	×	✓	×
S260M	Cls # finger mid phlanx,shaft	×	×	✓	×
S260N	Cls # finger mid phalanx,neck	×	×	✓	×
S260P	Cls # finger mid phalanx,head	×	×	✓	×
S260Q	Cls # finger mid phalanx,mlti	×	×	✓	×
S260R	Cls # finger distal phalanx	×	×	✓	×
S260S	Cls # finger dist phlanx,base	×	×	✓	×
S260T	Cls # finger dist phlnx,shaft	×	×	✓	×
S260U	Cls # finger dist phlanx,tuft	×	×	✓	×

Read Code	Read Term	Axial	Lower Limb	Upper Limb	Clinician Defined
N073	Loose body in knee	×	✓	×	×
N074	Chondromalacia patellae	×	✓	×	×
N07y	Oth. internal knee derangement	×	✓	×	×
N07y0	Old lat.collat.lig.disruption	×	✓	×	×
N07y1	Old med.collat.lig.disruption	×	✓	×	×
N07y2	Old ant.cruciate lig.disrupt.	×	✓	×	×
N07y3	Old post.cruciate lig.disrupt.	×	✓	×	×
N07y4	Old capsular knee lig.disrupt.	×	✓	×	×
N07y5	Locked knee	×	✓	×	×
N07y6	Patellofemoral maltracking	×	✓	×	×
N07y7	Old part tear lat collat lig	×	✓	×	×
N07y8	Old compl tear lat collat lig	×	✓	×	×
N07y9	Old post/lat caps complex tear	×	✓	×	×
N07yA	Old part tear med collat lig	×	✓	×	×
N07yB	Old compl tear med collat lig	×	✓	×	×
N07yC	Old med capsular complex tear	×	✓	×	×
N07yD	Old part tear ant cruciate lig	×	✓	×	×
N07yE	Old comp tear ant cruciate lig	×	✓	×	×
N07yF	Old part tear post cruciat lig	×	✓	×	×
N07yG	Old comp tear post cruciat lig	×	✓	×	×
N07yH	Locking knee	×	✓	×	×
N07yy	Other knee lig. old disruption	×	✓	×	×
N07yz	Other intern.knee derang.NOS	×	✓	×	×
N07z	Internal knee derangement NOS	×	✓	×	×
N08	Other derangement of joint	×	×	×	×
N0800	Artic.cart.dis.-site unspecif.	×	×	×	×
N0801	Artic.cart.dis.-shoulder	×	×	✓	×
N0802	Artic.cart.dis.-upper arm	×	×	✓	×
N0803	Artic.cart.dis.-forearm	×	×	✓	×
N0804	Artic.cart.dis.-hand	×	×	✓	×
N0805	Artic.cart.dis.-pelvic/thigh	×	✓	×	×
N0806	Artic.cart.dis.-ankle/foot	×	✓	×	×
N0809	Hill-Sachs lesion	×	×	✓	×
N080A	Reverse Hill-Sachs lesion	×	×	✓	×
N080B	Artic cart disord oth j-should	×	×	✓	×
N080C	Chondrolysis-femoral head	×	✓	×	×
N081	Loose body in joint-excl.knee	×	×	×	×
N0810	Loose body in joint - unspec.	×	×	×	×
N0811	Loose body joint-shoulder	×	×	✓	×
N0812	Loose body in joint upper arm	×	×	✓	×
N0813	Wrist joint loose body	×	×	✓	×
N0814	Loose body joint-hand	×	×	✓	×
N0815	Loose body joint-pelvic/thigh	×	✓	×	×
N0816	Loose body joint-ankle/foot	×	✓	×	×
S260V	Cls # finger dist phlnx,mallet	×	×	✓	×
S260W	Cls # finger dist phalanx,mlti	×	×	✓	×
S260x	Closed #phalanges-multiple	×	×	✓	×
S260z	Closed #phalanges of hand NOS	×	×	✓	×
S261	Open #phalanges of hand	×	×	✓	×
S2610	Open #phalanges of hand unsp.	×	×	✓	×
S2611	Op # md/prx phln/phlns,unsp pt	×	×	✓	×
S2612	Op # dist phln/phlns,unsp part	×	×	✓	×
S2613	Opn # thumb proximal phalanx	×	×	✓	×
S2614	Opn # thumb prox phlnx, base	×	×	✓	×
S2615	Opn # thumb prox phlnx, shaft	×	×	✓	×
S2616	Opn # thumb prox phlnx, neck	×	×	✓	×
S2617	Opn # thumb prox phlnx, head	×	×	✓	×
S2618	Open fracture thumb distal phalanx	×	×	✓	×
S2619	Opn # thumb dist phlnx, base	×	×	✓	×
S261A	Opn # thumb dist phlnx, shaft	×	×	✓	×
S261B	Opn # thumb dist phlnx tuft	×	×	✓	×
S261C	Opn # thumb dist phlnx, mallet	×	×	✓	×
S261D	Opn # finger prox phalanx	×	×	✓	×
S261E	Opn # finger prox phlnx, base	×	×	✓	×
S261F	Opn # finger prox phlnx, shaft	×	×	✓	×
S261G	Opn # finger prox phlnx, neck	×	×	✓	×
S261H	Opn # finger prox phlnx, head	×	×	✓	×
S261J	Opn # finger prox phlnx, mlti	×	×	✓	×
S261K	Opn # finger mid phalanx	×	×	✓	×
S261L	Opn # finger mid phlnx, base	×	×	✓	×
S261M	Opn # finger mid phlnx, shaft	×	×	✓	×
S261N	Opn # finger mid phlnx, neck	×	×	✓	×
S261P	Opn # finger mid phlnx, head	×	×	✓	×
S261Q	Opn # finger mid phlnx, mlti	×	×	✓	×
S261R	Opn # finger dist phalanx	×	×	✓	×
S261S	Opn # finger dist phlnx, base	×	×	✓	×
S261T	Opn # finger dist phlnx, shaft	×	×	✓	×
S261U	Opn # finger dist phlnx, tuft	×	×	✓	×
S261V	Opn # finger dist phlnx,mallet	×	×	✓	×
S261W	Opn # finger dist phlnx, mlti	×	×	✓	×
S261x	Open #phalanges-multiple sites	×	×	✓	×
S261z	Open #phalanges of hand NOS	×	×	✓	×
S262	Fracture of thumb	×	×	✓	×
S263	Fracture of other finger	×	×	✓	×
S264	Multiple fractures of fingers	×	×	✓	×
S26z	#Phalanges of hand NOS	×	×	✓	×
S27	Multiple #hand bones	×	×	✓	×
S270	Closed multiple #hand bones	×	×	✓	×

Read Code	Read Term	Axial	Lower Limb	Upper Limb	Clinician Defined	Read Code	Read Term	Axial	Lower Limb	Upper Limb	Clinician Defined
N0817	Loose body in joint, joint OS	×	×	×	×	S271	Open multiple #hand bones	×	×	✓	×
N0819	Loose body in shoulder joint	×	×	✓	×	S27z	Multiple #hand bones NOS	×	×	✓	×
N081A	Loose body, oth joint-shoulder	×	×	✓	×	S28	Ill-defined fracture of arm	×	×	✓	×
N081B	Loose body in elbow joint	×	×	✓	×	S280	Closed ill-defined #upper limb	×	×	✓	×
N081C	Loose body in wrist joint	×	×	✓	×	S281	Open ill-defined #upper limb	×	×	✓	×
N081D	Loose body in hip joint	×	✓	×	×	S28z	Ill-defined #upper limb NOS	×	×	✓	×
N081E	Loose body, oth joint-pelvis	×	✓	×	×	S290	Closed mult.#arms/ribs/sternum	✓	×	✓	×
N081F	Loose body in ankle joint	×	✓	×	×	S291	Open mult.#arms/ribs/sternum	✓	×	✓	×
N081G	Loose body in foot joint	×	✓	×	×	S292	Mult fract/clav,scapula+humrus	×	×	✓	×
N081z	Loose joint body (ex.knee)NOS	×	×	×	×	S2920	Clsd mult fract clav scap hum	×	×	✓	×
N082	Spontaneous joint dislocation	×	×	×	×	S2921	Open mult fract clav scap hum	×	×	✓	×
N0820	Patholog.disloc.-site unspecif	×	×	×	×	S293	Multiple fractures of forearm	×	×	✓	×
N0821	Patholog.disloc.-shoulder	×	×	✓	×	S294	Frac inv mult reg both up limb	×	×	✓	×
N0822	Patholog.disloc.-upper arm	×	×	✓	×	S2940	Cl fr inv mult reg both up lmb	×	×	✓	×
N0823	Wrist pathological dislocation	×	×	✓	×	S2941	Op fr inv mult reg both up lmb	×	×	✓	×
N0824	Patholog.disloc.-hand	×	×	✓	×	S29z	Mult.#arms/ribs/sternum NOS	✓	×	✓	×
N0825	Patholog.disloc.-pelvic/thigh	×	✓	×	×	S2A	Fractur/upper limb,lev unspec	×	×	✓	×
N0826	Patholog.disloc.-lower leg	×	✓	×	×	S2z	Fracture of upper limb NOS	×	×	✓	×
N0827	Patholog.disloc.-ankle/foot	×	✓	×	×	S3	Fracture of lower limb	×	✓	×	×
N0828	Patholog.disloc.-other specif.	×	×	×	×	S30	#Neck of femur	×	✓	×	×
N082A	Path disloc-shoulder joint	×	×	✓	×	S300	Cls # prox femur,transcerv	×	✓	×	×
N082B	Path disloc-oth joint-shoulder	×	×	✓	×	S3000	Cl # prx fem,intrcp sctn,unsp	×	✓	×	×
N082C	Path disloc humero-ulnar joint	×	×	✓	×	S3001	Cls # prox fmur,transepiphys	×	✓	×	×
N082D	Path disloc-superior RUJ	×	×	✓	×	S3002	Cls # prox fmur,midcerv sctn	×	✓	×	×
N082E	Path disloc-radial head	×	×	✓	×	S3003	Cls # prox fmur,basicervical	×	✓	×	×
N082F	Path disloc-inferior RUJ	×	×	✓	×	S3004	Closed fracture head of femur	×	✓	×	×
N082G	Path disloc-wrist joint	×	×	✓	×	S3005	Cl # prx fem,sbcp,Gdn grd unsp	×	✓	×	×
N082H	Path disloc-1st CMC joint	×	×	✓	×	S3006	Cl # prx fem,sbcap,Gdn grd I	×	✓	×	×
N082J	Path disloc-other CMC joint	×	×	✓	×	S3007	Cl # prx fem,sbcap,Gdn grd II	×	✓	×	×
N082K	Path disloc-MCP joint	×	×	✓	×	S3008	Cl # prx fem,sbcap,Gdn grd III	×	✓	×	×
N082L	Path disloc-PIP joint	×	×	✓	×	S3009	Cl # prx fem,sbcap,Gdn grd IV	×	✓	×	×
N082M	Path disloc-DIP joint	×	×	✓	×	S300y	Subcapital closed # femur	×	✓	×	×
N082N	Neuromuscular disloc-hip	×	✓	×	×	S300z	Cls # prox fmur,transcerv NOS	×	✓	×	×
N082P	Other acquired Path disloc-hip	×	✓	×	×	S301	Opn # prox fmur,transcerv	×	✓	×	×
N082Q	Path disloc-knee joint	×	✓	×	×	S3010	Op # prox fem,intcap sctn,unsp	×	✓	×	×
N082R	Path disloc-patellofem joint	×	✓	×	×	S3011	Opn # prox fmur,transepiphys	×	✓	×	×
N082S	Path disloc-ankle joint	×	✓	×	×	S3012	Opn # prox femur,midcerv sctn	×	✓	×	×
N082T	Path disloc-subtalar joint	×	✓	×	×	S3013	Opn # prox femur, basicervical	×	✓	×	×
N082U	Path disloc-midtarsal joint	×	✓	×	×	S3014	Open fracture head, femur	×	✓	×	×
N082V	Path disloc-TMT joint	×	✓	×	×	S3015	Op # prx fem subcap,Gdn gd uns	×	✓	×	×
N082W	Path disloc-1st MTP joint	×	✓	×	×	S3016	Op # prx fem,subcap,Gdn grd I	×	✓	×	×
N082X	Path disloc-lesser MTP joint	×	✓	×	×	S3017	Op # prx fem,subcap,Gdn grd II	×	✓	×	×
N082Y	Path disloc-toe IP joint	×	✓	×	×	S3018	Op # prx fem,subcp,Gdn grd III	×	✓	×	×
N083	Redislocation of joint	×	×	×	×	S3019	Op # prx fem,subcap,Gdn grd IV	×	✓	×	×

Read Code	Read Term	Axial	Lower Limb	Upper Limb	Clinician Defined	Read Code	Read Term	Axial	Lower Limb	Upper Limb	Clinician Defined
N0830	Recurr.joint disloc.-site unsp	×	×	×	×	S301y	Subcapital open # femur	×	✓	×	×
N0831	Recurr.joint disloc.-shoulder	×	×	✓	×	S301z	Opn # prox femur,transcerv NOS	×	✓	×	×
N0832	Recurr.joint disloc.-upper arm	×	×	✓	×	S302	Cls # prox femur,pertrochntrc	×	✓	×	×
N0833	Wrist - recurrent dislocation	×	×	✓	×	S3020	Closed #femur-lesser troch.	×	✓	×	×
N0834	Recurr.joint disloc.-hand	×	×	✓	×	S3021	Cl # prx fem-intrtrchntrc-2 pt	×	✓	×	×
N0835	Recurr.joint disloc-pelv/thigh	×	✓	×	×	S3022	Cls # prox fmur-subtrchntrc	×	✓	×	×
N0836	Patella-recurrent dislocation	×	✓	×	×	S3023	Cl # prx fem-intertroch-commin	×	✓	×	×
N0837	Recurr.joint disloc-ankle/foot	×	✓	×	×	S3024	Closed # femur intertrochant	×	✓	×	×
N083a	Carpal instability, V.I.S.I.	×	×	✓	×	S302z	Cl # prx fem-prtrchntr sct NOS	×	✓	×	×
N083A	Recurrent disloc shoulder-ant	×	×	✓	×	S303	Op # prox fem,pertrochanteric	×	✓	×	×
N083b	Carpal instab, ulnar transloc	×	×	✓	×	S3030	Open #femur-lesser trochanter	×	✓	×	×
N083B	Recurrent disloc shoulder-post	×	×	✓	×	S3031	Op # prx fem,intrtrchntr,2 prt	×	✓	×	×
N083c	Carpal instab, dorsal sublux	×	×	✓	×	S3032	Opn # prox fmur-subtrochntrc	×	✓	×	×
N083C	Recurrent sublux shoulder-ant	×	×	✓	×	S3033	Op # prx fem,intrtrchnt,cmmntd	×	✓	×	×
N083d	Carpal instability, other	×	×	✓	×	S3034	Open # femur, intertrochant	×	✓	×	×
N083D	Recurrent sublux shoulder-post	×	×	✓	×	S303z	Opn # prox fmur-prtrchntrc NOS	×	✓	×	×
N083e	Recurrent disloc - CMC joint	×	×	✓	×	S304	Pertrochanteric fracture	×	✓	×	×
N083E	Recurrent disloc shoulder-inf	×	×	✓	×	S305	Subtrochanteric fracture	×	✓	×	×
N083f	Recurrent sublux - CMC joint	×	×	✓	×	S30w	Cls # unsp proximal femur	×	✓	×	×
N083F	Recurrent sublux shoulder-inf	×	×	✓	×	S30x	Opn # unsp proximal femur	×	✓	×	×
N083g	Recurrent disloc - MCP joint	×	×	✓	×	S30y	Hip fracture NOS	×	✓	×	×
N083G	Recurrent disloc shoulder-ant	×	×	✓	×	S30z	Open #neck of femur NOS	×	✓	×	×
N083h	Recurrent sublux - MCP joint	×	×	✓	×	S31	Other #femur	×	✓	×	×
N083H	Recurrent sublux shoulder-ant	×	×	✓	×	S310	Closed #femur-shaft/unspecif.	×	✓	×	×
N083j	Recurrent disloc - IP joint	×	×	✓	×	S3100	Upper leg fracture NOS	×	✓	×	×
N083J	Recur disloc shoulder-multidir	×	×	✓	×	S3101	Closed fracture shaft of femur	×	✓	×	×
N083k	Recurrent sublux - IP joint	×	×	✓	×	S310z	Closed #femur-shaft/unsp.NOS	×	✓	×	×
N083K	Recur sublux shoulder-multidir	×	×	✓	×	S311	Open #femur-shaft/unspecified	×	✓	×	×
N083l	Recurrent disloc - hip	×	✓	×	×	S3110	Open #femur-unspecified	×	✓	×	×
N083L	Habitual disloc shoulder	×	×	✓	×	S3111	Open fracture shaft of femur	×	✓	×	×
N083m	Recurr disloc - other pelvis	×	✓	×	×	S311z	Open #femur-shaft/unspecif.NOS	×	✓	×	×
N083M	Habitual sublux shoulder	×	×	✓	×	S312	Closed fracture distal femur	×	✓	×	×
N083n	Recurrent disloc - knee	×	✓	×	×	S3120	Cls # distal femur, unsp	×	✓	×	×
N083N	Recurrent dislocation of elbow	×	×	✓	×	S3121	Cls # femoral condyle unsp	×	✓	×	×
N083p	Recurrent disloc - patella	×	✓	×	×	S3122	Closed #femur-lower epiphysis	×	✓	×	×
N083P	Recurrent subluxation of elbow	×	×	✓	×	S3123	Cls # dist femur supracndyar	×	✓	×	×
N083q	Recurrent sublux - patella	×	✓	×	×	S3124	Cls # dist femur,mdial condyle	×	✓	×	×
N083Q	Recurr disloc, sup rad-uln jt	×	×	✓	×	S3125	Cls # dist femur,latrl condyle	×	✓	×	×
N083r	Habitual disloc - patella	×	✓	×	×	S3126	Cls # dist fmur,bicndylr(T-Y#)	×	✓	×	×
N083R	Recurr sublux, sup rad-uln jt	×	×	✓	×	S312x	Cls # dist fem,cmmntd/intr-art	×	✓	×	×
N083s	Recurrent disloc - ankle	×	✓	×	×	S312z	Cls # dist femur NOS	×	✓	×	×
N083S	Recurrent disloc-radial head	×	×	✓	×	S313	Open fracture distal femur	×	✓	×	×
N083t	Recurrent sublux - ankle	×	✓	×	×	S3130	Opn # distal femur, unspec	×	✓	×	×
N083T	Recurrent sublux-radial head	×	×	✓	×	S3131	Opn # femoral condyle, unspec	×	✓	×	×

Read Code	Read Term	Axial	Lower Limb	Upper Limb	Clinician Defined
N083u	Recurrent disloc - foot joint	×	✓	×	×
N083U	Recurr disloc, inf rad-uln jt	×	×	✓	×
N083v	Recurrent sublux-subtal joint	×	✓	×	×
N083V	Recurr sublux, inf rad-uln jt	×	×	✓	×
N083w	Recurrent sublux-oth foot jt	×	✓	×	×
N083W	Recurrent dislocation of wrist	×	×	✓	×
N083x	Recurrent subluxation hip	×	✓	×	×
N083X	Carpal instability	×	×	✓	×
N083Y	Recurrent subluxation of wrist	×	×	✓	×
N083Z	Carpal instability, D.I.S.I.	×	×	✓	×
N084	Contracture of joint	×	×	×	×
N0840	Joint contracture-site unspec	×	×	×	×
N0841	Joint contracture-shoulder	×	×	✓	×
N0842	Joint contracture-upper arm	×	×	✓	×
N0843	Wrist joint contracture	×	×	✓	×
N0844	Joint contracture-hand	×	×	✓	×
N0845	Joint contracture-pelvic/thigh	×	✓	×	×
N0846	Knee joint contracture	×	✓	×	×
N0847	Joint contracture-ankle/foot	×	✓	×	×
N084a	Flexion contracture-knee	×	✓	×	×
N084A	Flexion contracture-shoulder	×	×	✓	×
N084b	Equinus contracture of the ankle	×	✓	×	×
N084B	Extension contracture-shoulder	×	×	✓	×
N084c	Calcaneus contracture-ankle	×	✓	×	×
N084C	Abduction contracture-shoulder	×	×	✓	×
N084d	Flexion contracture of MTPJ	×	✓	×	×
N084D	Adduction contracture-shoulder	×	×	✓	×
N084e	Extension contracture of MTPJ	×	✓	×	×
N084E	Int rotat contracture-shoulder	×	×	✓	×
N084f	Flexion contracture of toe IPJ	×	✓	×	×
N084F	Ext rotat contracture-shoulder	×	×	✓	×
N084g	Exten contracture of toe IPJ	×	✓	×	×
N084G	Flexion contracture - elbow	×	×	✓	×
N084H	Extension contracture - elbow	×	×	✓	×
N084J	Pronation contracture-forearm	×	×	✓	×
N084K	Supination contracture-forearm	×	×	✓	×
N084L	Flexion contracture - wrist	×	×	✓	×
N084M	Extension contracture- wrist	×	×	✓	×
N084N	Uln deviat contracture-wrist	×	×	✓	×
N084P	Rad deviat contracture-wrist	×	×	✓	×
N084Q	Flexion contracture of MCPJ	×	×	✓	×
N084R	Extension contracture of MCPJ	×	×	✓	×
N084S	Flexion contracture of PIPJ	×	×	✓	×
N084T	Flexion contracture of DIPJ	×	×	✓	×
S3132	Open #femur-lower epiphysis	×	✓	×	×
S3133	Opn # dist femur,supracndylr	×	✓	×	×
S3134	Opn # dist femur,mdial condyle	×	✓	×	×
S3135	Opn # dist femur,latrl condyle	×	✓	×	×
S3136	Opn # dist fem, bicondyl(T-Y#)	×	✓	×	×
S313x	Op # dist fem,commntd/intr-art	×	✓	×	×
S313z	Opn # of distal femur NOS	×	✓	×	×
S314	Fracture of shaft of femur	×	✓	×	×
S315	Fracture of lower end of femur	×	✓	×	×
S31z	#Femur NOS	×	✓	×	×
S32	#Patella	×	✓	×	×
S320	Closed fracture of the patella	×	✓	×	×
S3200	Closed # patella transverse	×	✓	×	×
S3201	Closed # patella,proximal pole	×	✓	×	×
S3202	Closed # patella, distal pole	×	✓	×	×
S3203	Closed # patella, vertical	×	✓	×	×
S3204	Cls # patella, stellate	×	✓	×	×
S321	Open fracture of the patella	×	✓	×	×
S3210	Open # patella, transverse	×	✓	×	×
S3211	Open # patella, proximal pole	×	✓	×	×
S3212	Open # patella, distal pole	×	✓	×	×
S3213	Open # patella, vertical	×	✓	×	×
S3214	Open # patella, stellate	×	✓	×	×
S32z	#Patella NOS	×	✓	×	×
S33	#Tibia and fibula	×	✓	×	×
S330	Cls # tibia + fibula, proximal	×	✓	×	×
S3300	Tibial tuberosity closed #	×	✓	×	×
S3301	Closed # proximal fibula	×	✓	×	×
S3302	Cls # tibia + fibula, proximal	×	✓	×	×
S3303	Cl # prx tib,med cndyle(plat)	×	✓	×	×
S3304	Cl # prx tib,ltrl cndyle(plat)	×	✓	×	×
S3305	Cls # prox tibia, bicondylar	×	✓	×	×
S3306	Closed fracture spine, tibia	×	✓	×	×
S3307	Closed # tubercle, tibia	×	✓	×	×
S3308	Closed fracture fibula, head	×	✓	×	×
S3309	Closed fracture fibula, neck	×	✓	×	×
S330z	Cls # tibia + fibula, prox NOS	×	✓	×	×
S331	Opn # tibia + fibula, proximal	×	✓	×	×
S3310	Tibial tuberosity open #	×	✓	×	×
S3311	Open fracture proximal fibula	×	✓	×	×
S3312	Opn # tibia + fibula, proximal	×	✓	×	×
S3313	Op # prox tib,med cndyle(plat)	×	✓	×	×
S3314	Opn # prox tibia,ltrl condyle	×	✓	×	×
S3315	Open # prox tibia, bicondylar	×	✓	×	×

Read Code	Read Term	Axial	Lower Limb	Upper Limb	Clinician Defined	Read Code	Read Term	Axial	Lower Limb	Upper Limb	Clinician Defined
N084U	Flexion contracture of hip	×	✓	×	×	S3316	Open fracture spine, tibia	×	✓	×	×
N084V	Extension contracture of hip	×	✓	×	×	S3317	Open fracture tubercle, tibia	×	✓	×	×
N084W	Abduction contracture of hip	×	✓	×	×	S3318	Open fracture fibula, head	×	✓	×	×
N084X	Adduction contracture of hip	×	✓	×	×	S3319	Open fracture fibula, neck	×	✓	×	×
N084Y	Int rotation contracture-hip	×	✓	×	×	S331z	Opn # tibia + fibula, prox NOS	×	✓	×	×
N084Z	Ext rotation contracture-hip	×	✓	×	×	S332	Closed # tibia/fibula shaft	×	✓	×	×
N085	Ankylosis of joint	×	×	×	×	S3320	Closed fracture shaft of tibia	×	✓	×	×
N0850	Joint ankylosis-site unspecif.	×	×	×	×	S3321	Closed # shaft of fibula	×	✓	×	×
N0851	Joint ankylosis-shoulder	×	×	✓	×	S3322	Cls # tibia and fibula shaft	×	✓	×	×
N0852	Joint ankylosis-upper arm	×	×	✓	×	S332z	Closed #tibia/fibula-shaft,NOS	×	✓	×	×
N0853	Wrist joint ankylosis	×	×	✓	×	S333	Open # of tibia/fibula, shaft	×	✓	×	×
N0854	Joint ankylosis-hand	×	×	✓	×	S3330	Open fracture shaft of tibia	×	✓	×	×
N0855	Joint ankylosis-pelvic/thigh	×	✓	×	×	S3331	Open fracture shaft of fibula	×	✓	×	×
N0856	Knee joint ankylosis	×	✓	×	×	S3332	Open # tibia and fibula, shaft	×	✓	×	×
N0857	Joint ankylosis-ankle/foot	×	✓	×	×	S333z	Open #tibia/fibula-shaft,NOS	×	✓	×	×
N085A	Ankylosis of shoulder joint	×	×	✓	×	S334	Closed fracture distal tibia	×	✓	×	×
N085B	Ankylosis other joint-shoulder	×	×	✓	×	S3340	Cls # dist tibia, extra-art	×	✓	×	×
N085C	Ankylosis of the elbow joint	×	×	✓	×	S3341	Cls # distal tibia, intra-art	×	✓	×	×
N085D	Ankylosis of superior RUJ	×	×	✓	×	S335	Open fracture distal tibia	×	✓	×	×
N085E	Ankylosis of inferior RUJ	×	×	✓	×	S3350	Opn # dist tibia, extra-art	×	✓	×	×
N085F	Ankylosis of the wrist joint	×	×	✓	×	S3351	Opn # dist tibia, intra-art	×	✓	×	×
N085G	Ankylosis of the 1st CMC joint	×	×	✓	×	S336	Fracture of upper end of tibia	×	✓	×	×
N085H	Ankylosis of other CMC joint	×	×	✓	×	S337	Fracture of shaft of tibia	×	✓	×	×
N085J	Ankylosis of MCP joint	×	×	✓	×	S338	Fracture of lower end of tibia	×	✓	×	×
N085K	Ankylosis of PIP joint	×	×	✓	×	S339	Fracture of fibula alone	×	✓	×	×
N085L	Ankylosis of DIP joint	×	×	✓	×	S3390	Closed fracture distal fibula	×	✓	×	×
N085M	Ankylosis of the hip joint	×	✓	×	×	S3391	Open fracture of distal fibula	×	✓	×	×
N085N	Ankylosis of other pelv joint	×	✓	×	×	S33x	Lower leg fracture NOS	×	✓	×	×
N085P	Ankylosis of the knee joint	×	✓	×	×	S33x0	Closed #tibia-unspecified NOS	×	✓	×	×
N085Q	Ankylosis of the ankle joint	×	✓	×	×	S33x1	Closed #fibula-unspecified NOS	×	✓	×	×
N085R	Ankylosis of subtalar joint	×	✓	×	×	S33x2	Cls # of tib + fib, unsp part	×	✓	×	×
N085S	Ankylosis - other tarsal joint	×	✓	×	×	S33xz	Closed #tibia/fibula-unsp.NOS	×	✓	×	×
N085T	Ankylosis of MTP joint	×	✓	×	×	S33y	Open #tibia/fibula-unspec.NOS	×	✓	×	×
N085U	Ankylosis of toe joint	×	✓	×	×	S33y0	Open #tibia-unspecified NOS	×	✓	×	×
N086	Unsp.intrapelv.protr.acetabul.	×	✓	×	×	S33y1	Open #fibula-unspecified NOS	×	✓	×	×
N0860	Protrusio acetabuli	×	✓	×	×	S33y2	Opn # of tib + fib, unsp part	×	✓	×	×
N0861	Protrus.acetabuli-pelvic/thigh	×	✓	×	×	S33yz	Open #tibia/fibula-unspec.NOS	×	✓	×	×
N086z	Protrusio acetabuli NOS	×	✓	×	×	S33z	#Tibia/fibula NOS	×	✓	×	×
N087	Fibrocartilage lesion of joint	×	×	×	×	S34	#Ankle	×	✓	×	×
N0870	Bankart lesion	×	×	✓	×	S340	Cls # ankle medial malleolus	×	✓	×	×
N0871	Reverse Bankart lesion	×	×	✓	×	S341	Opn # ankle, medial malleolus	×	✓	×	×
N0872	Glenoid labrum detachment	×	×	✓	×	S342	Cls # ankle lateral malleolus	×	✓	×	×
N0873	Glenoid labrum tear	×	×	✓	×	S3420	Cls # ankle,ltrl malleolus-low	×	✓	×	×
N0874	Triangular fibrocartilage tear	×	×	✓	×	S3421	Cls # ankle,ltrl malleolus,hgh	×	✓	×	×

Read Code	Read Term	Axial	Lower Limb	Upper Limb	Clinician Defined	Read Code	Read Term	Axial	Lower Limb	Upper Limb	Clinician Defined
N0875	Triangular fibrocartil detach	×	×	✓	×	S343	Opn # ankle, lateral malleolus	×	✓	×	×
N0876	Acetabular labrum detachment	×	✓	×	×	S3430	Opn # ankle,ltrl malleolus-low	×	✓	×	×
N0877	Acetabular labrum tear	×	✓	×	×	S3431	Opn # ankle,ltrl malleolus-hgh	×	✓	×	×
N0878	Snapping shoulder	×	×	✓	×	S344	Closed fracture ankle bimalleolar	×	✓	×	×
N08y0	Oth.joint deran.NEC-site unsp.	×	×	×	×	S3440	Cls # ankle,bimall,low fib #	×	✓	×	×
N08y1	Oth.joint deran.NEC-shoulder	×	×	✓	×	S3441	Cls # ankle,bimall,hgh fib #	×	✓	×	×
N08y2	Oth.joint deran.NEC-upper arm	×	×	✓	×	S345	Opn # ankle, bimalleolar	×	✓	×	×
N08y3	Oth.joint deran.NEC-forearm	×	×	✓	×	S3450	Opn # ankle,bimall,low fib #	×	✓	×	×
N08y4	Oth.joint deran.NEC-hand	×	×	✓	×	S3451	Opn # ankle,bimall,hgh fib #	×	✓	×	×
N08y5	Oth.joint deran.NEC-pelv/thigh	×	✓	×	×	S346	Cls # ankle trimalleolar	×	✓	×	×
N08y6	Oth.joint deran.NEC-lower leg	×	✓	×	×	S3460	Cls # ankle,trimall,low fib #	×	✓	×	×
N08y7	Oth.joint deran.NEC-ankle/foot	×	✓	×	×	S3461	Cls # ankle,trimall,hgh fib #	×	✓	×	×
N08yA	Flail joint	×	×	×	×	S347	Open fracture ankle trimalleolar	×	✓	×	×
N08z0	Joint derange.NOS-site unspec.	×	×	×	×	S3470	Opn # ankle,trimall,low fib #	×	✓	×	×
N08z1	Joint derange.NOS-shoulder	×	×	✓	×	S3471	Opn # ankle,trimall,hgh fib #	×	✓	×	×
N08z2	Joint derange.NOS-upper arm	×	×	✓	×	S348	Fracture of medial malleolus	×	✓	×	×
N08z3	Joint derange.NOS-forearm	×	×	✓	×	S349	Fracture of lateral malleolus	×	✓	×	×
N08z4	Joint derange.NOS-hand	×	×	✓	×	S34x	Closed fracture ankle unspecified	×	✓	×	×
N08z5	Joint derange.NOS-pelvic/thigh	×	✓	×	×	S34y	Open fracture ankle unspecified	×	✓	×	×
N08z6	Joint derange.NOS-ankle/foot	×	✓	×	×	S34z	#Ankle NOS	×	✓	×	×
N090	Swelling of joint - effusion	×	×	×	×	S35	Metatarsal bone fracture	×	✓	×	×
N0900	Joint effusion-site unspecif.	×	×	×	×	S350	Closed #calcaneus	×	✓	×	×
N0901	Joint effusion-shoulder region	×	×	✓	×	S3500	Cls # calcaneus, extra-art	×	✓	×	×
N0902	Joint effusion-upper arm	×	×	✓	×	S3501	Cls # calcaneus, intra-art	×	✓	×	×
N0903	Joint effusion of the forearm	×	×	✓	×	S351	Open #calcaneus	×	✓	×	×
N0904	Joint effusion of the hand	×	×	✓	×	S3510	Opn #s calcaneus, extra-art	×	✓	×	×
N0905	Joint effusion-pelvic/thigh	×	✓	×	×	S3511	Opn #s calcaneus, intra-art	×	✓	×	×
N0906	Knee joint effusion	×	✓	×	×	S352	March fracture	×	✓	×	×
N0907	Joint effusion-ankle/foot	×	✓	×	×	S3520	Closed #tarsal bone unspecif.	×	✓	×	×
N090A	Effusion of shoulder	×	×	✓	×	S3521	Closed fracture of astragalus	×	✓	×	×
N090B	Effusion of sternoclav joint	×	×	✓	×	S3522	Closed fracture navicular	×	✓	×	×
N090C	Effusion of acromioclav joint	×	×	✓	×	S3523	Closed fracture cuboid	×	✓	×	×
N090D	Effusion of elbow	×	×	✓	×	S3524	Closed # medial cuneiform	×	✓	×	×
N090E	Effusion of distal RUJ	×	×	✓	×	S3525	Cls # intermediate cuneiform	×	✓	×	×
N090F	Effusion of wrist	×	×	✓	×	S3526	Cls # lateral cuneiform	×	✓	×	×
N090G	Effusion of MCP joint	×	×	✓	×	S3527	Closed fracture metatarsal	×	✓	×	×
N090H	Effusion of PIP joint - finger	×	×	✓	×	S3528	Closed fracture talus, head	×	✓	×	×
N090J	Effusion of DIP joint - finger	×	×	✓	×	S3529	Closed fracture talus, neck	×	✓	×	×
N090K	Effusion of hip	×	✓	×	×	S352A	Closed fracture talus, body	×	✓	×	×
N090L	Effusion of sacro-iliac joint	✓	×	×	×	S352B	Closed # metatarsal base	×	✓	×	×
N090M	Effusion of knee	×	✓	×	×	S352C	Closed # metatarsal shaft	×	✓	×	×
N090N	Effusion, tibio-fibular joint	×	✓	×	×	S352D	Closed # metatarsal neck	×	✓	×	×
N090P	Effusion of ankle	×	✓	×	×	S352E	Closed # metatarsal head	×	✓	×	×
N090Q	Effusion of subtalar joint	×	✓	×	×	S352F	Closed # metatarsal, multiple	×	✓	×	×

Read Code	Read Term	Axial	Lower Limb	Upper Limb	Clinician Defined	Read Code	Read Term	Axial	Lower Limb	Upper Limb	Clinician Defined
N090R	Effusion, talonavicular joint	×	✓	×	×	S352G	Closed tarsal #s, multiple	×	✓	×	×
N090S	Effusion of other tarsal joint	×	✓	×	×	S352H	Closed fracture of cuneiforms	×	✓	×	×
N090T	Effusion of 1st MTP joint	×	✓	×	×	S352z	Closed #tarsal/metatarsal NOS	×	✓	×	×
N090U	Effusion of lesser MTP joint	×	✓	×	×	S353	Open #other tarsal/metatarsal	×	✓	×	×
N090V	Effusion of IP joint of toe	×	✓	×	×	S3530	Open #tarsal bone unspecified	×	✓	×	×
N090X	Chronic joint effusion	×	×	×	×	S3531	Open fracture of astragalus	×	✓	×	×
N090Y	Acute joint effusion	×	×	×	×	S3532	Open fracture navicular	×	✓	×	×
N090z	Effusion of joint NOS	×	×	×	×	S3533	Open fracture cuboid	×	✓	×	×
N0910	Haemarthrosis-site unspecified	×	×	×	×	S3534	Open fracture medial cuneiform	×	✓	×	×
N0911	Haemarthrosis-shoulder	×	×	✓	×	S3535	Open # intermediate cuneiform	×	✓	×	×
N0912	Haemarthrosis-upper arm	×	×	✓	×	S3536	Open # lateral cuneiform	×	✓	×	×
N0913	Wrist haemarthrosis	×	×	✓	×	S3537	Open fracture metatarsal	×	✓	×	×
N0914	Haemarthrosis-hand	×	×	✓	×	S3538	Open fracture talus, head	×	✓	×	×
N0915	Hip haemarthrosis	×	✓	×	×	S3539	Open fracture talus, neck	×	✓	×	×
N0916	Haemarthrosis of the knee	×	✓	×	×	S353A	Open fracture talus, body	×	✓	×	×
N0917	Haemarthrosis of the ankle	×	✓	×	×	S353B	Open fracture metatarsal base	×	✓	×	×
N091A	Haemarthrosis of shoulder	×	×	✓	×	S353C	Open fracture metatarsal shaft	×	✓	×	×
N091B	Haemarthrosis-sternoclav joint	×	×	✓	×	S353D	Open fracture metatarsal neck	×	✓	×	×
N091C	Haemarthrosis-acromioclav jt	×	×	✓	×	S353E	Open fracture metatarsal head	×	✓	×	×
N091D	Haemarthrosis of elbow	×	×	✓	×	S353F	Open # metatarsal, multiple	×	✓	×	×
N091E	Haemarthrosis of distal RUJ	×	×	✓	×	S353G	Open tarsal #s, multiple	×	✓	×	×
N091F	Haemarthrosis of wrist	×	×	✓	×	S353H	Open fracture cuneiforms	×	✓	×	×
N091G	Haemarthrosis of MCP joint	×	×	✓	×	S353z	Open #tarsal/metatarsal NOS	×	✓	×	×
N091H	Haemarthrosis, PIPJ-finger	×	×	✓	×	S354	Fracture of calcaneus	×	✓	×	×
N091J	Haemarthrosis, DIPJ-finger	×	×	✓	×	S355	Fracture of talus	×	✓	×	×
N091K	Haemarthrosis of hip	×	✓	×	×	S356	Fracture of metatarsal bone	×	✓	×	×
N091L	Haemarthrosis of SIJ	✓	×	×	×	S35z	#Tarsal/metatarsal bones NOS	×	✓	×	×
N091M	Haemarthrosis of knee	×	✓	×	×	S36	#Phalanges of foot	×	✓	×	×
N091N	Haemarthrosis of tib-fib joint	×	✓	×	×	S360	Closed #phalanges of foot	×	✓	×	×
N091P	Haemarthrosis of ankle	×	✓	×	×	S3600	Cls # proximal phalanx, toe	×	✓	×	×
N091Q	Haemarthrosis - subtalar joint	×	✓	×	×	S3601	Cls # middle phalanx, toe	×	✓	×	×
N091R	Haemarthrosis - talonav joint	×	✓	×	×	S3602	Cls # distal phalanx, toe	×	✓	×	×
N091S	Haemarthrosis-oth tarsal joint	×	✓	×	×	S3603	Cls # multiple phalanges, toe	×	✓	×	×
N091T	Haemarthrosis-1st MTPJ	×	✓	×	×	S361	Open #phalanges of foot	×	✓	×	×
N091U	Haemarthrosis of les MTP joint	×	✓	×	×	S3610	Open # proximal phalanx, toe	×	✓	×	×
N091V	Haemarthrosis of IP joint-toe	×	✓	×	×	S3611	Open # middle phalanx, toe	×	✓	×	×
N0920	Villonod.synovitis-site unspec	×	×	×	×	S3612	Open # distal phalanx, toe	×	✓	×	×
N0921	Villonod.synovitis-shoulder	×	×	✓	×	S3613	Open # multiple phalanges, toe	×	✓	×	×
N0922	Villonod.synovitis-upper arm	×	×	✓	×	S362	Fracture of great toe	×	✓	×	×
N0923	Villonod.synovitis-forearm	×	×	✓	×	S3620	Closed fracture of great toe	×	✓	×	×
N0924	Villonod.synovitis-hand	×	×	✓	×	S3621	Open fracture of great toe	×	✓	×	×
N0925	Villonod.synovitis-pelv./thigh	×	✓	×	×	S363	Fracture of other toe	×	✓	×	×
N0926	Villonod.synovitis-lower leg	×	✓	×	×	S36z	#Phalanges of foot NOS	×	✓	×	×
N0927	Villonod.synovitis-ankle/foot	×	✓	×	×	S37	Fractur/lower limb,levl unspec	×	✓	×	×

Read Code	Read Term	Axial	Lower Limb	Upper Limb	Clinician Defined	Read Code	Read Term	Axial	Lower Limb	Upper Limb	Clinician Defined
N092A	Villonod synovitis-shoulder	×	×	✓	×	S370	Closed frac/lower limb,lev uns	×	✓	×	×
N092B	Villonod synovitis-sternclav j	×	×	✓	×	S371	Open frac/lower limb,lev uns	×	✓	×	×
N092C	Villonod synovitis-acromclav j	×	×	✓	×	S3x	Other/multiple #lower limb	×	✓	×	×
N092D	Villonodular synovitis-elbow	×	×	✓	×	S3X	Other/multiple #lower limb	×	✓	×	×
N092E	Villonod synovitis-dist RUJ	×	×	✓	×	S3x0	Other/mult.closed #lower limb	×	✓	×	×
N092F	Villonodular synovitis - wrist	×	×	✓	×	S3x1	Other/mult.open #lower limb	×	✓	×	×
N092G	Villonodular synovitis of MCPJ	×	×	✓	×	S3x2	Multiple fractures of femur	×	✓	×	×
N092H	Villonod synovitis PIPJ finger	×	×	✓	×	S3x3	Multiple fractures/lower leg	×	✓	×	×
N092J	Villonod synovitis DIPJ finger	×	×	✓	×	S3x4	Multiple fractures of foot	×	✓	×	×
N092K	Villonodular synovitis of hip	×	✓	×	×	S3xz	Other/mult.#lower limb NOS	×	✓	×	×
N092L	Villonodular synovitis of SIJ	✓	×	×	×	S3yz	Mult.#legs/arms/ribs/stern.NOS	✓	×	✓	×
N092M	Villonodular synovitis of knee	×	✓	×	×	S3z	Fracture NOS	×	×	×	×
N092N	Villonod synovitis, tib-fib jt	×	✓	×	×	S3z00	Greenstick fracture	×	×	×	×
N092P	Villonod synovitis-ankle	×	✓	×	×	S40	Temporomandibular joint disloc	×	×	×	×
N092Q	Villonod synovitis-subtalar jt	×	✓	×	×	S400	Closed dislocation of jaw	×	×	×	×
N092R	Villonod synovitis-talonav jt	×	✓	×	×	S401	Open dislocation of jaw	×	×	×	×
N092S	Villonod synovitis-oth tars jt	×	✓	×	×	S402	Closed subluxation jaw	×	×	×	×
N092T	Villonod synovitis-1st MTPJ	×	✓	×	×	S403	Open subluxation jaw	×	×	×	×
N092U	Villonod synovitis-lesser MTPJ	×	✓	×	×	S40z	Dislocation of jaw NOS	×	×	×	×
N092V	Villonod synovitis, IPJ-toe	×	✓	×	×	S41	Disloctn/subluxation shoulder	×	×	✓	×
N0930	Palindromic rheum.-site unspec	×	×	×	×	S410	Cls traumtc disloctn shoulder	×	×	✓	×
N0931	Palindromic rheum.-shoulder	×	×	✓	×	S4100	Cls traum disloctn shouldr jnt	×	×	✓	×
N0932	Palindromic rheum.-upper arm	×	×	✓	×	S4101	Cl tr dis shd jt ant (sub-cor)	×	×	✓	×
N0933	Palindromic rheum.-forearm	×	×	✓	×	S4102	Posterior dislocation shoulder	×	×	✓	×
N0934	Palindromic rheum.-hand	×	×	✓	×	S4103	Inferior dislocation shoulder	×	×	✓	×
N0935	Palindromic rheum.-pelv./thigh	×	✓	×	×	S4104	Cls tmtc disl acromio-clav jt	×	×	✓	×
N0936	Palindromic rheum.-lower leg	×	✓	×	×	S4105	Cls traumatic disloctn scapula	×	×	✓	×
N0937	Palindromic rheum.-ankle/foot	×	✓	×	×	S410y	Othr cls trmtc disloc shoulder	×	×	✓	×
N094	Ache in joint	×	×	×	✓	S410z	Cls trmtc dislctn shoulder NOS	×	×	✓	×
N0940	Arthralgia - site unspecified	×	×	×	✓	S411	Opn traumtc disloctn shoulder	×	×	✓	×
N0941	Arthralgia - shoulder	×	×	✓	✓	S4110	Opn trmtc dislctn shoulder jnt	×	×	✓	×
N0942	Elbow joint pain	×	×	✓	✓	S4111	Op tr dis shld jt,ant(sub-cor)	×	×	✓	×
N0943	Arthralgia - forearm	×	×	✓	✓	S4112	Opn trmtc dslctn shldr jt,post	×	×	✓	×
N0944	Arthralgia - hand	×	×	✓	✓	S4113	Op tr ds shd jt,inf(infr-glen)	×	×	✓	×
N0945	Arthralgia - pelvic/thigh	×	✓	×	✓	S4114	Opn trm dislc acromio-clav jt	×	×	✓	×
N0946	Arthralgia - lower leg	×	✓	×	✓	S4115	Opn traumatic disloctn scapula	×	×	✓	×
N0947	Ankle joint pain	×	✓	×	✓	S411y	Othr opn trmtc disloctn shlder	×	×	✓	×
N094A	Arthralgia of shoulder	×	×	✓	✓	S411z	Opn trmtc disloctn shouldr NOS	×	×	✓	×
N094B	Arthralgia - sternoclav joint	×	×	✓	✓	S4120	Cls trmtc subluxatn shldr jnt	×	×	✓	×
N094C	Arthralgia - acromioclav joint	×	×	✓	✓	S4121	Cls trm sublux acromio-clav jt	×	×	✓	×
N094D	Arthralgia of elbow	×	×	✓	✓	S412z	Cls traumtc sublux shldr NOS	×	×	✓	×
N094E	Arthralgia of distal RUJ	×	×	✓	✓	S413	Opn traumtc subluxatn shoulder	×	×	✓	×
N094F	Arthralgia of wrist	×	×	✓	✓	S4130	Opn traumtc sublux shouldr jnt	×	×	✓	×
N094G	Arthralgia of MCP joint	×	×	✓	✓	S4131	Opn trm sublux acromio-clav jt	×	×	✓	×

Read Code	Read Term	Axial	Lower Limb	Upper Limb	Clinician Defined	Read Code	Read Term	Axial	Lower Limb	Upper Limb	Clinician Defined
N094H	Arthralgia of PIPJ of finger	×	×	✓	✓	S413z	Opn trmtc sublux shoulder NOS	×	×	✓	×
N094J	Arthralgia of DIPJ of finger	×	×	✓	✓	S41z	Dislocation of shoulder NOS	×	×	✓	×
N094K	Arthralgia of hip	×	✓	×	✓	S42	Disloctn/subluxation elbow	×	×	✓	×
N094L	Arthralgia of sacro-iliac joint	✓	×	×	✓	S420	Cls traumtc disloctn elbow jnt	×	×	✓	×
N094M	Arthralgia of knee	×	✓	×	✓	S4200	Cls trmtc disloctn elbow,unsp	×	×	✓	×
N094N	Arthralgia of tib-fib joint	×	✓	×	✓	S4201	Cls trmtc dislc elbow jnt, ant	×	×	✓	×
N094P	Arthralgia of ankle	×	✓	×	✓	S4202	Cls trmtc dislc elbow jnt,post	×	×	✓	×
N094Q	Arthralgia of subtalar joint	×	✓	×	✓	S4203	Cls trmtc dislc elbow jnt,medl	×	×	✓	×
N094R	Arthralgia of talonavic joint	×	✓	×	✓	S4204	Cls trmtc dislc elbow jt,ltrl	×	×	✓	×
N094S	Arthralgia of oth tarsal joint	×	✓	×	✓	S4205	Cls trm dislc elbow jt,divrgnt	×	×	✓	×
N094T	Arthralgia of 1st MTP joint	×	✓	×	✓	S4206	Cls trm disl sup radio-ulnr jt	×	×	✓	×
N094U	Arthralgia of lesser MTP joint	×	✓	×	✓	S420y	Othr cls trmtc disloctn elbow	×	×	✓	×
N094V	Arthralgia of IP joint of toe	×	✓	×	✓	S420z	Cls traumtc disloctn elbow NOS	×	×	✓	×
N094W	Anterior knee pain	×	✓	×	✓	S421	Opn traumtc disloctn elbow jnt	×	×	✓	×
N0950	Stiff joint NEC-site unspecif.	×	×	×	✓	S4210	Opn trmtc disloctn elbow,unsp	×	×	✓	×
N0951	Stiff joint NEC-shoulder	×	×	✓	✓	S4211	Opn trmtc dislc elbow jt,ant	×	×	✓	×
N0952	Stiff joint NEC-upper arm	×	×	✓	✓	S4212	Opn trmtc disloc elbow jt,post	×	×	✓	×
N0953	Wrist stiff	×	×	✓	✓	S4213	Opn trmtc dslctn elbow jt,medl	×	×	✓	×
N0954	Stiff joint NEC-hand	×	×	✓	✓	S4214	Opn trmtc dslctn elbow jt,ltrl	×	×	✓	×
N0955	Stiff joint NEC-pelvic/thigh	×	✓	×	✓	S4215	Opn trmtc dslc elbow jt,dvrgnt	×	×	✓	×
N0956	Knee stiff	×	✓	×	✓	S4216	Opn trmt dslc sup radio-uln jt	×	×	✓	×
N0957	Stiff joint NEC-ankle/foot	×	✓	×	✓	S421y	Othr opn trmtc disloctn elbow	×	×	✓	×
N095A	Stiff shoulder NEC	×	×	✓	✓	S421z	Opn traumtc disloctn elbow NOS	×	×	✓	×
N095B	Stiff sternoclavic joint NEC	×	×	✓	✓	S422	Cls traumtc subluxation elbow	×	×	✓	×
N095C	Stiff acromioclavic joint NEC	×	×	✓	✓	S4220	Cls traumtc sublux elbow jnt	×	×	✓	×
N095D	Stiff elbow NEC	×	×	✓	✓	S4221	Cls trm sublux sup rad-uln jnt	×	×	✓	×
N095E	Stiff distal rad-uln joint NEC	×	×	✓	✓	S423	Opn traumtc sublux elbow	×	×	✓	×
N095F	Stiff wrist NEC	×	×	✓	✓	S4230	Opn traumtc sublux elbow jnt	×	×	✓	×
N095G	Stiff MCP joint NEC	×	×	✓	✓	S4231	Op trm sublux sup radio-uln jt	×	×	✓	×
N095H	Stiff PIP joint of finger NEC	×	×	✓	✓	S424	Dislocation of radial head	×	×	✓	×
N095J	Stiff DIP joint of finger NEC	×	×	✓	✓	S42z	Dislocation of elbow NOS	×	×	✓	×
N095K	Stiff hip NEC	×	✓	×	✓	S43	Disloctn/subluxation wrist	×	×	✓	×
N095L	Stiff sacro-iliac joint NEC	✓	×	×	✓	S430	Cls traumtc disloctn wrist	×	×	✓	×
N095M	Stiff knee NEC	×	✓	×	✓	S4300	Dislocation of radius - distal	×	×	✓	×
N095N	Stiff tibio-fibular joint NEC	×	✓	×	✓	S4301	Radioulnar dislocation- distal	×	×	✓	×
N095P	Stiff ankle NEC	×	✓	×	✓	S4302	Cls trm dslc radiocarpal jnt	×	×	✓	×
N095Q	Stiff subtalar joint NEC	×	✓	×	✓	S4303	Cls trmtc dslct mid carpal jnt	×	×	✓	×
N095R	Stiff talonavicular joint NEC	×	✓	×	✓	S4304	Cls traumatic disloctn CMCJ	×	×	✓	×
N095S	Stiff other tarsal joint NEC	×	✓	×	✓	S4305	Cls trmtc dislct prox metacarp	×	×	✓	×
N095T	Stiff 1st MTP joint NEC	×	✓	×	✓	S4306	Cls trm disloc lunate (volar)	×	×	✓	×
N095U	Stiff lesser MTP joint NEC	×	✓	×	✓	S4307	Cls trm disl peri-lunate(dors)	×	×	✓	×
N095V	Stiff IP joint of toe NEC	×	✓	×	✓	S4308	Cls trmtc dislc othr carpal jt	×	×	✓	×
N095W	Stiff finger	×	×	✓	✓	S430y	Othr cls traumtc dislctn wrist	×	×	✓	×
N0961	Other joint sympt.-shoulder	×	×	✓	✓	S430z	Cls traumtc disloctn wrist NOS	×	×	✓	×

Read Code	Read Term	Axial	Lower Limb	Upper Limb	Clinician Defined
N0962	Other joint sympt.-upper arm	×	×	✓	✓
N0963	Other joint sympt.-forearm	×	×	✓	✓
N0964	Other joint sympt.-hand	×	×	✓	✓
N0965	Other joint sympt.-pelv./thigh	×	✓	×	✓
N0966	Knee gives way	×	✓	×	✓
N0967	Unstable ankle	×	✓	×	✓
N096A	Other symptoms - shoulder	×	×	✓	✓
N096B	Other symptoms - sternoclav jt	×	×	✓	✓
N096C	Other symptoms - acromioclav j	×	×	✓	✓
N096D	Other symptoms - elbow	×	×	✓	✓
N096E	Other symptoms - distal RUJ	×	×	✓	✓
N096F	Other symptoms - wrist	×	×	✓	✓
N096G	Other symptoms - MCPJ	×	×	✓	✓
N096H	Other symptoms - PIPJ, finger	×	×	✓	✓
N096J	Other symptoms - DIPJ, finger	×	×	✓	✓
N096K	Other symptoms - hip	×	✓	×	✓
N096L	Other symptoms - SIJ	✓	×	×	✓
N096M	Other symptoms - knee	×	✓	×	✓
N096N	Other symptoms - tib-fib joint	×	✓	×	✓
N096P	Other symptoms - ankle	×	✓	×	✓
N096Q	Other symptoms - subtal joint	×	✓	×	✓
N096R	Other symptoms - talonav joint	×	✓	×	✓
N096S	Other symptoms - oth tarsal jt	×	✓	×	✓
N096T	Other symptoms - 1st MTPJ	×	✓	×	✓
N096U	Other symptoms - lesser MTPJ	×	✓	×	✓
N096V	Other symptoms - IPJ of toe	×	✓	×	✓
N0971	Walking diffic.-pelvic/thigh	×	✓	×	×
N0972	Walking difficulty-lower leg	×	✓	×	×
N0973	Walking difficulty-ankle/foot	×	✓	×	×
N0980	Synov osteochondromat-shoulder	×	×	✓	×
N0981	Synov osteochondromat st-cla j	×	×	✓	×
N0982	Synov osteochondromat ac-cla j	×	×	✓	×
N0983	Synov osteochondromat-elbow	×	×	✓	×
N0984	Synov osteochondromat-dist RUJ	×	×	✓	×
N0985	Synov osteochondromat-wrist	×	×	✓	×
N0986	Synov osteochondromat-MCPJ	×	×	✓	×
N0987	Synov osteochondromat PIPJ-fin	×	×	✓	×
N0988	Synov osteochondromat DIPJ-fin	×	×	✓	×
N0989	Synov osteochondromat-hip	×	✓	×	×
N098A	Synov osteochondromat-SIJ	✓	×	×	×
N098B	Synov osteochondromat-knee	×	✓	×	×
N098C	Synov osteochondromat-tibfib j	×	✓	×	×
N098D	Synov osteochondromat-ankle	×	✓	×	×
N098E	Synov osteochondromat-subtal j	×	✓	×	×
S431	Opn traumtc dislocatn the wrist	×	×	✓	×
S4310	Opn trmtc dislocatn wrist,unsp	×	×	✓	×
S4311	Opn trm disl dist radio-uln jt	×	×	✓	×
S4312	Opn trmtc dislctn radiocarp jt	×	×	✓	×
S4313	Opn trmtc disloct mid carp jnt	×	×	✓	×
S4314	Opn traumatic dislocatn CMCJ	×	×	✓	×
S4315	Opn trm disloct prox metacarpl	×	×	✓	×
S4316	Opn trm disloct lunate (volar)	×	×	✓	×
S4317	Opn trm dslc peri-lunate(dors)	×	×	✓	×
S4318	Opn trm disloc othr carpal jnt	×	×	✓	×
S431y	Othr opn trmtc dislocatn wrist	×	×	✓	×
S431z	Opn traumtc dislocatn wrist NOS	×	×	✓	×
S432	Cls traumtc subluxation wrist	×	×	✓	×
S4320	Cls traumtc sublux wrist,unsp	×	×	✓	×
S4321	Cls traumatic sublux DRUJ	×	×	✓	×
S4322	Cls trmtc sublux radiocarp jt	×	×	✓	×
S4323	Cls trmtc sublux mid carp jt	×	×	✓	×
S4324	Cls traumatic subluxation CMCJ	×	×	✓	×
S4325	Cls trm sublux lunate (volar)	×	×	✓	×
S4326	Cls trm sublux peri-lun(dors)	×	×	✓	×
S432y	Cls trmtc sublux other carp jt	×	×	✓	×
S433	Opn traumtc sublux wrist	×	×	✓	×
S4330	Opn trm sublux wrist, unspec	×	×	✓	×
S4331	Opn traumatic sublux DRUJ	×	×	✓	×
S4332	Opn trmtc sublux radiocarp jt	×	×	✓	×
S4333	Opn trmtc sublux mid carp jt	×	×	✓	×
S4334	Opn traumtc subluxation CMCJ	×	×	✓	×
S4335	Opn trm sublux lunate (volar)	×	×	✓	×
S4336	Opn trm sublux peri-lun(dors)	×	×	✓	×
S433y	Opn trmtc sublux other carp jt	×	×	✓	×
S43z	Dislocation of wrist NOS	×	×	✓	×
S44	Dislocation of thumb	×	×	✓	×
S440	Cls traumtc dislocatn digit	×	×	✓	×
S4400	Cls trmtc dislocatn finger,unsp	×	×	✓	×
S4401	Cls traumatic dislocatn MCPJ	×	×	✓	×
S4402	Cls trmtc interphalangl dislc	×	×	✓	×
S4403	Cls traumatic dislocatn DIPJ	×	×	✓	×
S4404	Cls traumatic dislocatn PIPJ	×	×	✓	×
S4405	Cls trmtc disloct IP jnt thumb	×	×	✓	×
S4406	Cls trmtc disloct multi digits	×	×	✓	×
S440z	Cls trmtc dislocatn finger NOS	×	×	✓	×
S441	Opn traumatic dislocatn digit	×	×	✓	×
S4410	Opn trmtc dislocatn finger,unsp	×	×	✓	×
S4411	Open traumatic dislocation MPJ	×	×	✓	×

Read Code	Read Term	Axial	Lower Limb	Upper Limb	Clinician Defined
N098F	Synov osteochondromat-talnav j	×	✓	×	×
N098G	Synov osteochondromat-oth ta j	×	✓	×	×
N098H	Synov osteochondromat-1st MTPJ	×	✓	×	×
N098J	Synov osteochondromat-les MTPJ	×	✓	×	×
N098K	Synov osteochondromat-IPJ-toe	×	✓	×	×
N099	Clicking joint	×	×	×	×
N0990	Clicking shoulder	×	×	✓	×
N0991	Clicking sternoclavic joint	×	×	✓	×
N0992	Clicking acromioclavic joint	×	×	✓	×
N0993	Clicking elbow	×	×	✓	×
N0994	Clicking distal rad-uln joint	×	×	✓	×
N0995	Clicking wrist	×	×	✓	×
N0996	Clicking MCP joint	×	×	✓	×
N0997	Clicking PIP joint of finger	×	×	✓	×
N0998	Clicking DIP joint of finger	×	×	✓	×
N0999	Clicking hip	×	✓	×	×
N099B	Clicking sacro-iliac joint	✓	×	×	×
N099C	Clicking knee	×	✓	×	×
N099D	Clicking tibio-fibular joint	×	✓	×	×
N099E	Clicking ankle	×	✓	×	×
N099F	Clicking subtalar joint	×	✓	×	×
N099G	Clicking talonavicular joint	×	✓	×	×
N099H	Clicking other tarsal joint	×	✓	×	×
N099J	Clicking 1st MTP joint	×	✓	×	×
N099K	Clicking lesser MTP joint	×	✓	×	×
N099L	Clicking IP joint of toe	×	✓	×	×
N09A	Patellofemoral disorder	×	✓	×	×
N09AX	Disorder of patella unspecified	×	✓	×	×
N09B	Osteophyte	×	×	×	×
N09C	Fistula of joint	×	×	×	×
N09y	Calcification of joint	×	×	×	×
N09y0	Other joint dis.-site unspec.	×	×	×	×
N09y1	Other joint dis.-shoulder	×	×	✓	×
N09y2	Other joint dis.-upper arm	×	×	✓	×
N09y3	Other joint dis.-forearm	×	×	✓	×
N09y4	Other joint dis.-hand	×	×	✓	×
N09y5	Other joint dis.-pelvic/thigh	×	✓	×	×
N09y6	Other joint dis.-lower leg	×	✓	×	×
N09y7	Other joint dis.-ankle/foot	×	✓	×	×
N09z0	Joint disord.NOS-site unspecif	×	×	×	×
N09z1	Joint disord.NOS-shoulder	×	×	✓	×
N09z2	Joint disord.NOS-upper arm	×	×	✓	×
N09z3	Joint disord.NOS-forearm	×	×	✓	×
N09z4	Joint disord.NOS-hand	×	×	✓	×
S4412	Opn trmtc interphalangeal dslc	×	×	✓	×
S4413	Opn trmtc dislocation DIPJ	×	×	✓	×
S4414	Opn trmtc dislocation PIPJ	×	×	✓	×
S4415	Opn trmtc dslctn IP jnt thumb	×	×	✓	×
S4416	Opn trmtc dslctn multi digits	×	×	✓	×
S441z	Opn trmtc dslctn finger NOS	×	×	✓	×
S442	Cls trmtc subluxation digit	×	×	✓	×
S4420	Cls trmtc sublux digit, unsp	×	×	✓	×
S4421	Cls trmtc subluxation MPJ	×	×	✓	×
S4422	Cls trmtc subluxation DIPJ	×	×	✓	×
S4423	Cls trmtc subluxation PIPJ	×	×	✓	×
S4424	Cls trmtc sublux IPJ thumb	×	×	✓	×
S4425	Cls trmtc sublux multi digits	×	×	✓	×
S443	Opn trmtc subluxation digit	×	×	✓	×
S4430	Opn trmtc sublux digit, unsp	×	×	✓	×
S4431	Open traumatic subluxation MPJ	×	×	✓	×
S4432	Opn trmtc sublux IPJ thumb	×	×	✓	×
S4433	Opn traumatic subluxation DIPJ	×	×	✓	×
S4434	Opn traumatic subluxation PIPJ	×	×	✓	×
S4435	Opn trmtc sublux multi digits	×	×	✓	×
S44z	Dislocation finger/thumb NOS	×	×	✓	×
S45	Dislocation or subluxation of hip	×	✓	×	×
S450	Cls traumatic dislocation hip	×	✓	×	×
S4500	Cls trmtc dslctn hip, unsp	×	✓	×	×
S4501	Cls trmtc dslctn hip jt, post	×	✓	×	×
S4502	Cls trmtc obturator dslctn hip	×	✓	×	×
S4503	Cls trmtc dslctn hip jt, anter	×	✓	×	×
S450z	Cls trmtc dislocation hip NOS	×	✓	×	×
S451	Opn traumatic dislocation hip	×	✓	×	×
S4510	Opn trmtc dslctn hip, unsp	×	✓	×	×
S4511	Opn trmtc dslctn hip jt, post	×	✓	×	×
S4512	Opn trmtc obturator dslctn hip	×	✓	×	×
S4513	Opn trmtc dslctn hip jt, anter	×	✓	×	×
S451z	Opn trmtc dislocation hip NOS	×	✓	×	×
S452	Cls trmtc subluxation hip jt	×	✓	×	×
S4520	Cls trmtc sublux hip jt, unsp	×	✓	×	×
S4521	Cls trmtc sublux hip jt, post	×	✓	×	×
S4522	Cls trmtc sublux hip jt, ant	×	✓	×	×
S453	Opn trmtc subluxation hip jt	×	✓	×	×
S4530	Opn trmtc sublux hip jt, unsp	×	✓	×	×
S4531	Opn trmtc sublux hip jt, post	×	✓	×	×
S4532	Opn trmtc sublux hip jt, anter	×	✓	×	×
S45z	Dislocation of hip NOS	×	✓	×	×
S46	Dislocation/subluxation knee	×	✓	×	×

Read Code	Read Term	Axial	Lower Limb	Upper Limb	Clinician Defined
N09z5	Joint disord.NOS-pelvic/thigh	×	✓	×	×
N09z6	Joint disord.NOS-lower leg	×	✓	×	×
N09z7	Joint disord.NOS-ankle/foot	×	✓	×	×
N1	Vertebral column syndromes	✓	×	×	✓
N10	Inflammatory spondylopathies	✓	×	×	×
N100	Ankylosing spondylitis	✓	×	×	×
N101	Spinal enthesopathy	✓	×	×	✓
N102	Sacroiliitis NEC	✓	×	×	✓
N10y	Other inflamm.spondylopathies	✓	×	×	✓
N10y0	Inflamm.spondylop.in dis. EC	✓	×	×	✓
N10yz	Other inflamm.spondylop.NOS	✓	×	×	✓
N10z	Spondylitis NOS	✓	×	×	✓
N11	Arthritis of spine	✓	×	×	✓
N110	Cervical spond.- no myelopathy	✓	×	×	✓
N1100	One lev Cx spondyl-no myelop	✓	×	×	✓
N1101	Two lev Cx spondyl-no myelop	✓	×	×	✓
N1102	Mult lev Cx spondyl-no myelop	✓	×	×	✓
N111	Cervical spond.+ myelopathy	✓	×	×	×
N1110	One lev Cx spondyl + myelop	✓	×	×	×
N1111	Two lev Cx spondyl + myelop	✓	×	×	×
N1112	Mult lev Cx spondyl + myelop	✓	×	×	×
N1113	Cervical myelopathy	✓	×	×	×
N112	Thoracic spond.-no myelopathy	✓	×	×	✓
N1120	One lev th spondyl-no myelop	✓	×	×	✓
N1121	Two lev th spondyl-no myelop	✓	×	×	✓
N1122	Mult lev th spondyl-no myelop	✓	×	×	✓
N1123	Dorsal spondylo w/o myelopath	✓	×	×	✓
N113	Thoracic spond.+ myelopathy	✓	×	×	×
N1130	One lev th spondyl + myelop	✓	×	×	×
N1131	Two lev th spondyl + myelop	✓	×	×	×
N1132	Mult lev th spondyl + myelop	✓	×	×	×
N114	Degeneration of lumbar spine	✓	×	×	✓
N1140	One lev lumbsac spond-no myelo	✓	×	×	✓
N1141	Two lev lumbsac spond-no myelo	✓	×	×	✓
N1142	Mult lev lumbsac spond-no myel	✓	×	×	✓
N115	Lumbosacral spond.+ myelopathy	✓	×	×	×
N1150	One lev lumbsac spond + myelop	✓	×	×	×
N1151	Two lev lumbsac spond + myelop	✓	×	×	×
N1152	Mult lev lumbsac spond + myelo	✓	×	×	×
N116	Kissing spine	✓	×	×	×
N117	Ankylosing verteb.hyperostosis	✓	×	×	×
N118	Traumatic spondylopathy	✓	×	×	×
N119	Cx spondylosis + radiculopathy	✓	×	×	✓
N1190	One lev Cx spondyl + radiculop	✓	×	×	✓
S460	Acute meniscal tear medial	×	✓	×	×
S4600	Ac meniscal tear,med,ant horn	×	✓	×	×
S4601	Ac meniscal tear,med,post horn	×	✓	×	×
S4602	Ac menscl tear,med,bckt hndle	×	✓	×	×
S4603	Ac meniscal tear,med,radial	×	✓	×	×
S4604	Ac mnscl tr,med,periph,dtchmt	×	✓	×	×
S4605	Ac mnscl tear,med,horiz clvge	×	✓	×	×
S461	Acute meniscal tear lateral	×	✓	×	×
S4610	Ac meniscal tear,lat,ant horn	×	✓	×	×
S4611	Ac meniscal tear,lat,post horn	×	✓	×	×
S4612	Ac menscl tear,lat,bckt hndle	×	✓	×	×
S4613	Ac meniscal tear,lat,radial	×	✓	×	×
S4614	Ac mnscl tr,lat,periph,dtchmt	×	✓	×	×
S4615	Ac mnscl tear,lat,horiz clvge	×	✓	×	×
S462	Other acute meniscus tear	×	✓	×	×
S463	Cls trm dslctn patello-fem jt	×	✓	×	×
S4630	Cls trm dslctn pat-fem jt,lat	×	✓	×	×
S4631	Cls trm dslctn pat-fem jt,med	×	✓	×	×
S464	Opn trm dslctn patello-fem jt	×	✓	×	×
S4640	Opn trm dslctn pat-fem jt lat	×	✓	×	×
S4641	Opn trm dslctn pat-fem jt,med	×	✓	×	×
S465	Other cls trm dslctn knee	×	✓	×	×
S4650	Cls trm dslctn knee, unspec	×	✓	×	×
S4651	Cls trm dslctn knee jt, ant	×	✓	×	×
S4652	Cls trm dslctn knee jt, post	×	✓	×	×
S4653	Cls trm dslctn knee jt, medial	×	✓	×	×
S4654	Cls trm dslctn knee jt,lateral	×	✓	×	×
S4655	Cls trm dslct knee jt,rotatory	×	✓	×	×
S4656	Cls trm dslctn, head fibula	×	✓	×	×
S465z	Cls trm dslctn knee NOS	×	✓	×	×
S466	Other opn trm dslctn knee	×	✓	×	×
S4660	Opn trm dslctn knee, unspec	×	✓	×	×
S4661	Opn trm dslctn knee jt, ant	×	✓	×	×
S4662	Opn trm dslctn knee jt, post	×	✓	×	×
S4663	Opn trm dslctn knee jt, medial	×	✓	×	×
S4664	Opn trm dslctn knee jt,lateral	×	✓	×	×
S4665	Opn trm dslct knee jt,rotatory	×	✓	×	×
S4666	Opn trm dslctn, head fibula	×	✓	×	×
S466z	Open dislocation knee NOS	×	✓	×	×
S467	Cls trmtc sublux pat-fem jt	×	✓	×	×
S4670	Cls trm sublux pat-fem jt,ltrl	×	✓	×	×
S4671	Cls trm sublux pat-fem jt,med	×	✓	×	×
S468	Opn trmtc sublux pat-fem jt	×	✓	×	×
S4680	Opn trm sublux pat-fem jt,ltrl	×	✓	×	×

Read Code	Read Term	Axial	Lower Limb	Upper Limb	Clinician Defined	Read Code	Read Term	Axial	Lower Limb	Upper Limb	Clinician Defined
N1191	Two lev Cx spondyl + radiculop	✓	×	×	✓	S4681	Opn trm sublux pat-fem jt,med	×	✓	×	×
N1192	Mult lev Cx spondyl+radiculop	✓	×	×	✓	S469	Cls trmtc sublux knee jt	×	✓	×	×
N11A	Cx spondyl + vasc compression	✓	×	×	×	S4690	Cls trmtc sublux knee jt,unsp	×	✓	×	×
N11B	Th spondyl + radiculop	✓	×	×	✓	S4691	Cls trmtc sublux knee jt,ant	×	✓	×	×
N11B0	One lev th spondyl + radiculop	✓	×	×	✓	S4692	Cls trmtc sublux knee jt,post	×	✓	×	×
N11B1	Two lev th spondyl + radiculop	✓	×	×	✓	S4693	Cls trm sublux knee jt,medial	×	✓	×	×
N11B2	Mult lev th spondyl+radiculop	✓	×	×	✓	S4694	Cls trmtc sublux knee jt,ltrl	×	✓	×	×
N11C	Lumbsac spondyl + radiculopath	✓	×	×	✓	S4695	Cls trm sublux knee jt,rotatry	×	✓	×	×
N11C0	1 lev lumbsac spond+radiculop	✓	×	×	✓	S4696	Cls trmtc sublux,head fibula	×	✓	×	×
N11C1	2 lev lumbsac spond+radiculop	✓	×	×	✓	S46A	Opn trmtc sublux knee jt	×	✓	×	×
N11C2	Multi lev lumbsac spond+radicu	✓	×	×	✓	S46A0	Opn trmtc sublux knee jt,unsp	×	✓	×	×
N11D0	Osteoarthritis of cervical spine	✓	×	×	✓	S46A1	Opn trmtc sublux knee jt,ant	×	✓	×	×
N11D1	Osteoarthritis of thoracic spine	✓	×	×	✓	S46A2	Opn trmtc sublux knee jt,post	×	✓	×	×
N11D2	Osteoarthritis of lumbar spine	✓	×	×	✓	S46A3	Opn trm sublux knee jt,medial	×	✓	×	×
N11D3	Osteoarthritis of spine NOS	✓	×	×	✓	S46A4	Opn trmtc sublux knee jt,ltrl	×	✓	×	×
N11y	Other spondyloses/allied dis.	✓	×	×	✓	S46A5	Opn trm sublux knee jt,rotatry	×	✓	×	×
N11y0	Brucella spondylitis	✓	×	×	×	S46A6	Opn trmtc sublux,head fibula	×	✓	×	×
N11y1	Enterobacterial spondylitis	✓	×	×	×	S46B	Tear/articulr cart/knee,currnt	×	✓	×	×
N11y2	Neuropathic spondylopathy	✓	×	×	×	S46C	Inj/multipl structures of knee	×	✓	×	×
N11z	Osteoarthritis spine	✓	×	×	✓	S46D	Recurrent subluxation, patella	×	✓	×	×
N11z0	Spondylosis-no myelopathy,NOS	✓	×	×	✓	S46z	Dislocation of knee NOS	×	✓	×	×
N11z1	Spondylosis + myelopathy, NOS	✓	×	×	×	S47	Dislocation/sublux ankle	×	✓	×	×
N11zz	Spondylosis NOS	✓	×	×	✓	S470	Cls trmtc dislocation ankle jt	×	✓	×	×
N12	Intervertebral disc disorders	✓	×	×	✓	S472	Cls trmtc sublux ankle jt	×	✓	×	×
N120	PID - prol cerv disc,no myelop	✓	×	×	✓	S473	Opn trmtc sublux ankle jt	×	✓	×	×
N121	Thoracic disc displ.-no myelop	✓	×	×	✓	S47z	Dislocation of ankle NOS	×	✓	×	×
N122	Lumbar disc displacement	✓	×	×	✓	S48	Dislocation/sublux foot	×	✓	×	×
N123	Intervertebral disc prol. NOS	✓	×	×	✓	S480	Cls trmtc dislocation foot	×	✓	×	×
N124	Schmorl's nodes	✓	×	×	×	S4800	Cls trmtc dslctn foot,unsp	×	✓	×	×
N1240	Schmorl's nodes-unspec. region	✓	×	×	×	S4801	Cls trmtc tarsal dslctn,unsp	×	✓	×	×
N1241	Schmorl's nodes-thoracic regn.	✓	×	×	×	S4802	Cls trmtc dslctn,midtarsal jt	×	✓	×	×
N1242	Schmorl's nodes-lumbar region	✓	×	×	×	S4803	Cls trm dslc,tarso-metatrsl jt	×	✓	×	×
N124z	Schmorl's nodes-region NOS	✓	×	×	×	S4804	Cls trm metatarsal dslctn,unsp	×	✓	×	×
N125	Cervical disc degeneration	✓	×	×	✓	S4805	Cl trm dsl,mtatrso-phln jt,sgl	×	✓	×	×
N126	Thoracic disc degeneration	✓	×	×	✓	S4806	Cl traum dslc toe, IPJ, single	×	✓	×	×
N127	Lumbar disc degeneration	✓	×	×	✓	S4807	Cl tr dsl,mtatrs-phlng jt,mlti	×	✓	×	×
N128	Degenerative disc disease NOS	✓	×	×	✓	S4808	Cl traum disloc toe,IPJ,multi	×	✓	×	×
N129	PID - prol i/v disc + myelop	✓	×	×	✓	S4809	Cls trmtc dslctn,pantalar	×	✓	×	×
N1290	Unspec.disc disorder+myelop.	✓	×	×	×	S480A	Cls trmtc dslctn,subtalar jt	×	✓	×	×
N1291	Cervical disc disord.+myelop.	✓	×	×	×	S480z	Cls trmtc dslctn foot NOS	×	✓	×	×
N1292	Thoracic disc disord.+myelop.	✓	×	×	×	S481	Opn trmtc dslctn foot	×	✓	×	×
N1293	Lumbar disc disord.+myelopathy	✓	×	×	×	S4810	Opn trmtc dslctn foot,unsp	×	✓	×	×
N129z	Disc disorder+myelopathy NOS	✓	×	×	×	S4811	Opn trmtc tarsal dslctn,unsp	×	✓	×	×
N12A	Postlaminectomy syndrome	✓	×	×	×	S4812	Opn trmtc dslctn,midtarsal jt	×	✓	×	×

Read Code	Read Term	Axial	Lower Limb	Upper Limb	Clinician Defined	Read Code	Read Term	Axial	Lower Limb	Upper Limb	Clinician Defined
N12A0	Postlaminectomy syndr.unspec.	✓	×	×	×	S4813	Opn trm dslc,tarso-metatrsl jt	×	✓	×	×
N12A1	Cervical postlaminectomy syndr	✓	×	×	×	S4814	Opn trm metatarsal dslc,unsp	×	✓	×	×
N12A2	Thoracic postlaminectomy syndr	✓	×	×	×	S4815	Op trm dsl,mtatrso-phln jt,sgl	×	✓	×	×
N12A3	Lumbar postlaminectomy syndr.	✓	×	×	×	S4816	Open traum disloc toe,IPJ,sing	×	✓	×	×
N12Az	Postlaminectomy syndrome NOS	✓	×	×	×	S4817	Op tr dsl,mtatrso-phln jt,mlti	×	✓	×	×
N12B	Disc prolapse with myelopathy	✓	×	×	×	S4818	Open traum disloc toe,IPJ,mult	×	✓	×	×
N12B0	Cx disc prolapse + myelopathy	✓	×	×	×	S4819	Opn trmtc dslctn,pantalar	×	✓	×	×
N12B1	Th disc prolapse + myelopathy	✓	×	×	×	S481A	Opn trmtc dslctn,subtalar jt	×	✓	×	×
N12B2	Lu disc prolapse + myelopathy	✓	×	×	×	S481z	Opn trmtc dslctn foot NOS	×	✓	×	×
N12C	Disc prolapse + radiculopathy	✓	×	×	✓	S482	Cls trmtc sublux,foot	×	✓	×	×
N12C0	Cx disc prolapse+radiculopathy	✓	×	×	✓	S4820	Cls trmtc sublux,foot,unsp	×	✓	×	×
N12C1	Th disc prolapse+radiculopathy	✓	×	×	✓	S4821	Cls trm sublux,tarsal jt,unsp	×	✓	×	×
N12C2	Lu disc prolapse+radiculopathy	✓	×	×	✓	S4822	Cls trmtc sublux,midtarsal jt	×	✓	×	×
N12C3	Lu disc prol+caud eq compress	✓	×	×	×	S4823	Cls trm sublux,trso-mtatrsl jt	×	✓	×	×
N12C4	Prol lumb interv disc sciatic	✓	×	×	✓	S4824	Cl tr sublx,mtatrs-phln jt,sgl	×	✓	×	×
N12D	Narrowing disc space	✓	×	×	✓	S4825	Cl traum sublux toe,IPJ,single	×	✓	×	×
N12z	Other/unspec.disc disorders	✓	×	×	✓	S4826	Cl tr sblx,mtatrs-phln jt,mlti	×	✓	×	×
N12z0	Other disc disorders unspecif.	✓	×	×	✓	S4827	Cl trm sublux toe,IPJ,multi	×	✓	×	×
N12z1	Other cervical disc disorders	✓	×	×	✓	S4828	Cls trmtc sublux,pantalar	×	✓	×	×
N12z2	Other thoracic disc disorders	✓	×	×	✓	S4829	Cls trmtc sublux,subtalar jt	×	✓	×	×
N12z3	Other lumbar disc disorders	✓	×	×	✓	S483	Opn trmtc sublux,foot	×	✓	×	×
N12z4	Cervical discitis	✓	×	×	✓	S4830	Opn trmtc sublux,foot,unsp	×	✓	×	×
N12z5	Annular tear of cervical disc	✓	×	×	✓	S4831	Opn trm sublux,tarsal jt,unsp	×	✓	×	×
N12z6	Resorption of cervical disc	✓	×	×	✓	S4832	Opn trmtc sublux,midtarsal jt	×	✓	×	×
N12z7	Calcification of cervical disc	✓	×	×	×	S4833	Op trm sublux,tarso-mtatrsl jt	×	✓	×	×
N12z8	Thoracic discitis	✓	×	×	✓	S4834	Op trm sublx mtatrs-phl jt,sgl	×	✓	×	×
N12z9	Annular tear of thoracic disc	✓	×	×	✓	S4835	Opn trm sublux toe,IPJ,single	×	✓	×	×
N12zA	Resorption of thoracic disc	✓	×	×	✓	S4836	Op tr sblx,mtatrs-phln jt,mlti	×	✓	×	×
N12zB	Calcification of thoracic disc	✓	×	×	×	S4837	Op traum sublux toe,IPJ,multi	×	✓	×	×
N12zC	Lumbar discitis	✓	×	×	×	S4838	Opn trm sublux,pantalar	×	✓	×	×
N12zD	Annular tear of lumbar disc	✓	×	×	✓	S4839	Opn trm sublux,subtalar jt	×	✓	×	×
N12zE	Resorption of lumbar disc	✓	×	×	✓	S48z	Dislocation of foot NOS	×	✓	×	×
N12zF	Calcification of lumbar disc	✓	×	×	×	S490	Cls dslc cervical spine	✓	×	×	×
N12zG	Infect intervert disc - pyogen	✓	×	×	×	S4900	Closed disloc.cerv.spine unsp.	✓	×	×	×
N12zH	Cerv disc disord + radiculopth	✓	×	×	✓	S4901	Cls dslc atlanto-occipital jnt	✓	×	×	×
N12zz	Disc disorders NOS	✓	×	×	✓	S4902	Cls dslc atlanto-axial joint	✓	×	×	×
N13	Other cervical disorders	✓	×	×	✓	S4903	Closed dislocation C2/C3	✓	×	×	×
N130	Cervical spinal stenosis	✓	×	×	✓	S4904	Closed dislocation C3/C4	✓	×	×	×
N1300	Idiopathic Cx spinal stenosis	✓	×	×	✓	S4905	Closed dislocation C4/C5	✓	×	×	×
N1301	Degenerativ Cx spinal stenosis	✓	×	×	✓	S4906	Closed dislocation C5/C6	✓	×	×	×
N1302	Iatrogenic Cx spinal stenosis	✓	×	×	✓	S4907	Closed dislocation C6/C7	✓	×	×	×
N1303	Cx spin stenos due to oth dis	✓	×	×	✓	S4908	Closed dislocation C7/T1	✓	×	×	×
N131	Cervicalgia	✓	×	×	✓	S4909	Cl spnl dslc+cerv crd lsn,unsp	✓	×	×	×
N132	Cervicocranial syndrome	✓	×	×	✓	S490A	Cl spnl dslc+comp cerv crd lsn	✓	×	×	×

Read Code	Read Term	Axial	Lower Limb	Upper Limb	Clinician Defined	Read Code	Read Term	Axial	Lower Limb	Upper Limb	Clinician Defined
N133	Cervicobrachial syndrome	✓	×	✓	✓	S490B	Cls spnl dslc+ant cerv crd lsn	✓	×	×	×
N134	Brachial (cervical) neuritis	×	×	✓	✓	S490C	Cl spn dslc+cntrl cerv crd lsn	✓	×	×	×
N135	Torticollis unspecified	✓	×	×	✓	S490D	Cls spn dslc+post cerv crd lsn	✓	×	×	×
N1350	Intermittent torticollis	✓	×	×	✓	S490x	Closed disloc.mult.cerv.vert.	✓	×	×	×
N1351	Rheumatic torticollis	✓	×	×	✓	S490z	Closed disloc.cervic.vert.NOS	✓	×	×	×
N135z	Stiff neck NOS	✓	×	×	✓	S491	Open dislocation of neck	✓	×	×	×
N136	Panniculitis of neck	✓	×	×	×	S4910	Open disloc.cerv.spine unspec.	✓	×	×	×
N137	Cervical post.long.lig.ossific	✓	×	×	×	S4911	Open dslc atlanto-occipital jt	✓	×	×	×
N13y	Other cervical syndromes	✓	×	×	✓	S4912	Open dslc atlanto-axial jt	✓	×	×	×
N13y0	Cervical syndrome NEC	✓	×	×	✓	S4913	Open dislocation C2/C3	✓	×	×	×
N13y1	Klippel's disease	✓	×	×	×	S4914	Open dislocation C3/C4	✓	×	×	×
N13y2	Crick in neck	✓	×	×	✓	S4915	Open dislocation C4/C5	✓	×	×	×
N13y3	Cervical root syndrome	✓	×	×	✓	S4916	Open dislocation C5/C6	✓	×	×	×
N13yz	Other cervical syndromes NOS	✓	×	×	✓	S4917	Open dislocation C6/C7	✓	×	×	×
N13z	Cervical and neck disorders NOS	✓	×	×	✓	S4918	Open dislocation C7/T1	✓	×	×	×
N14	Other/unspecif.back disorder	✓	×	×	✓	S4919	Opn spnl dsl+cerv crd lsn,unsp	✓	×	×	×
N140	Spinal stenosis	✓	×	×	✓	S491A	Opn spn dslc+comp cerv crd lsn	✓	×	×	×
N1400	Spinal stenosis unspec.region	✓	×	×	✓	S491B	Opn spnl dslc+ant cerv crd lsn	✓	×	×	×
N1401	Thoracic spinal stenosis	✓	×	×	✓	S491C	Opn spn dslc+ctrl cerv crd lsn	✓	×	×	×
N1402	Lumbar spinal stenosis	✓	×	×	✓	S491D	Opn spnl dsl+post cerv crd lsn	✓	×	×	×
N1403	Idiopathic th spinal stenosis	✓	×	×	✓	S491x	Open disloc.mult.cerv.vertebra	✓	×	×	×
N1404	Degenerativ th spinal stenosis	✓	×	×	✓	S491z	Open disloc.cervical vert.NOS	✓	×	×	×
N1405	Iatrogenic th spinal stenosis	✓	×	×	✓	S492	Cls dslc thoracic+lumbar spine	✓	×	×	×
N1406	Th spin stenos due to oth dis	✓	×	×	✓	S4920	Cls dslc lumbar spine	✓	×	×	×
N1407	Idiopathic lu spinal stenosis	✓	×	×	✓	S4921	Cls dslc thoracic vertebra	✓	×	×	×
N1408	Degenerativ lu spinal stenosis	✓	×	×	✓	S4922	Cls spn dslc+thrc crd lsn,unsp	✓	×	×	×
N1409	Iatrogenic lu spinal stenosis	✓	×	×	✓	S4923	Cls spnl dsl+comp thrc crd lsn	✓	×	×	×
N140A	Lu spin stenos due to oth dis	✓	×	×	✓	S4924	Cls spnl dslc+ant thrc crd lsn	✓	×	×	×
N140z	Spinal stenosis NOS	✓	×	×	✓	S4925	Cls spn dslc+cent thrc crd lsn	✓	×	×	×
N141	Acute back pain - thoracic	✓	×	×	✓	S4926	Cls spn dslc+post thrc crd lsn	✓	×	×	×
N142	Acute back pain - lumbar	✓	×	×	✓	S4927	Cl spn dsl+lmbr crd lsn unsp	✓	×	×	×
N1420	Lumbago with sciatica	✓	✓	×	✓	S4928	Cls spnl dsl+comp lmbr crd lsn	✓	×	×	×
N143	Acute back pain + sciatica	✓	✓	×	✓	S4929	Cls spnl dslc+ant lmbr crd lsn	✓	×	×	×
N144	Thoracic/lumbosacral neuritis	✓	×	×	✓	S492A	Cls spn dslc+cent lmbr crd lsn	✓	×	×	×
N1440	Thoracic neuritis, unspecified	✓	×	×	✓	S492B	Cls spnl dsl+post lmbr crd lsn	✓	×	×	×
N1441	Lumbosacral neuritis unspecif.	✓	×	×	✓	S492C	Cls spnl dslc+cauda equina lsn	✓	×	×	×
N144z	Thoracic/lumbosac.neuritis NOS	✓	×	×	✓	S492z	Cls dslc thrcic+lmbr spine NOS	✓	×	×	×
N145	Acute back pain - unspecified	✓	×	×	✓	S493	Open disloc.thoracic/lumbar	✓	×	×	×
N146	Disorders of the sacrum	✓	×	×	✓	S4930	Open dislocation lumbar spine	✓	×	×	×
N1460	Lumbosacral ankylosis	✓	×	×	×	S4931	Opn dslc thoracic spine	✓	×	×	×
N1461	Sacroiliac ankylosis	✓	×	×	×	S4932	Opn spn dslc+thrc crd lsn,unsp	✓	×	×	×
N1462	Sacral ankylosis NOS	✓	×	×	×	S4933	Opn spnl dsl+comp thrc crd lsn	✓	×	×	×
N1463	Lumbosacral strain	✓	×	×	×	S4934	Opn spnl dslc+ant thrc crd lsn	✓	×	×	×
N1464	Sacroiliac instability	✓	×	×	✓	S4935	Opn spn dslc+cent thrc crd lsn	✓	×	×	×

Read Code	Read Term	Axial	Lower Limb	Upper Limb	Clinician Defined	Read Code	Read Term	Axial	Lower Limb	Upper Limb	Clinician Defined
N1465	Sacral instability NOS	✓	×	×	✓	S4936	Opn spn dslc+post thrc crd lsn	✓	×	×	×
N1466	Sacroiliac disorder	✓	×	×	✓	S4937	Op spn dsl+lmbr crd lsn unsp	✓	×	×	×
N146z	Sacroiliac strain	✓	×	×	×	S4938	Opn spnl dsl+comp lmbr crd lsn	✓	×	×	×
N147	Disorders of the coccyx	✓	×	×	✓	S4939	Opn spnl dslc+ant lmbr crd lsn	✓	×	×	×
N1470	Unspecified disorder of coccyx	✓	×	×	✓	S493A	Opn spn dslc+cent lmbr crd lsn	✓	×	×	×
N1471	Hypermobility of the coccyx	✓	×	×	✓	S493B	Opn spnl dsl+post lmbr crd lsn	✓	×	×	×
N1472	Coccygodynia	✓	×	×	✓	S493C	Opn spnl dslc+cauda equina lsn	✓	×	×	×
N147z	Coccyx disorder NOS	✓	×	×	✓	S493z	Open disloc.thorac./lumbar NOS	✓	×	×	×
N148	Ankylosis/instab Cx,Th,Lu spin	✓	×	×	×	S494	Closed disloc.other vertebra	✓	×	×	×
N1480	Atlanto-occipital ankylosis	✓	×	×	×	S4940	Closed dislocation spine unsp.	✓	×	×	×
N1481	Atlanto-axial ankylosis	✓	×	×	×	S4941	Closed dislocation coccyx	✓	×	×	×
N1482	Cervical spine ankylosis	✓	×	×	×	S4942	Closed dislocation sacrum	✓	×	×	×
N1483	Cervico-thoracic ankylosis	✓	×	×	×	S494z	Closed dislocation spine NOS	✓	×	×	×
N1484	Thoracic spine ankylosis	✓	×	×	×	S495	Open disloc.other vertebra	✓	×	×	×
N1485	Thoraco-lumbar ankylosis	✓	×	×	×	S4950	Open dislocation spine unspec.	✓	×	×	×
N1486	Lumbar spine ankylosis	✓	×	×	×	S4951	Open dislocation coccyx	✓	×	×	×
N1487	Atlanto-occipital instability	✓	×	×	×	S4952	Open dislocation sacrum	✓	×	×	×
N1488	Atlanto-axial instability	✓	×	×	×	S495z	Open dislocation spine NOS	✓	×	×	×
N1489	Cervical spine instability	✓	×	×	×	S4960	Closed disloc sternoclavic. jt	✓	×	×	×
N148A	Cervico-thoracic instability	✓	×	×	×	S4961	Cls trm dslc pelvis	×	✓	×	×
N148B	Thoracic spine instability	✓	×	×	×	S4962	Cls trm dslc sterno-clav jt	×	×	✓	×
N148C	Lumbar spine instability	✓	×	×	×	S4963	Cls trm dslc,stern-clav jt,ant	×	×	✓	×
N149	Back stiffness	✓	×	×	✓	S4964	Cls trm dsl,stern-clav jt,post	×	×	✓	×
N14X	Sacrococygeal disorders,NEC	✓	×	×	✓	S4965	Cls trm dslc laryngl cartilage	✓	×	×	×
N14y	Facet joint syndrome	✓	×	×	✓	S4966	Cls trm dslc costo-vertebr jt	✓	×	×	×
N14z	Back disorder/symptom NOS	✓	×	×	✓	S4967	Cls trm dslc costo-chondral jt	✓	×	×	×
N1y	Vertebral column disorders OS	✓	×	×	✓	S496z	Closed traumatic disloctn NOS	×	×	×	×
N1y0	Rec atlantoax subl + myelopath	✓	×	×	×	S497	Other open trmtc dislocation	×	×	×	×
N1y1	Fatigue fracture of vertebra	✓	×	×	×	S4970	Opn trm dslc sternum	✓	×	×	×
N1z	Vertebral column disorder NOS	✓	×	×	✓	S4971	Opn trm dslc pelvis	×	✓	×	×
N210	Adhesive capsulitis - shoulder	×	×	✓	✓	S4972	Opn trm dslc sterno-clav jt	×	×	✓	×
N211	Rotator cuff shoulder syndrome	×	×	✓	✓	S4973	Opn trm dslc,stern-clav jt,ant	×	×	✓	×
N2110	Rotator cuff syndrome unspecif	×	×	✓	✓	S4974	Opn trm dsl,stern-clav jt,post	×	×	✓	×
N2111	Calcifying tendinitis shoulder	×	×	✓	×	S4975	Opn dslc laryngl cartilage	✓	×	×	×
N2112	Bicipital tenosynovitis	×	×	✓	✓	S4976	Opn dslc costo-vertebr jt	✓	×	×	×
N2113	Supraspinatus tendinitis	×	×	✓	✓	S4977	Opn trm dslc costo-chondral jt	✓	×	×	×
N2114	Part thickn rotator cuff tear	×	×	✓	×	S497z	Open dislocation NOS	×	×	×	×
N2115	Full thickn rotator cuff tear	×	×	✓	×	S498	Cls sublux cervical spine	✓	×	×	×
N2116	Subacromial bursitis	×	×	✓	✓	S4980	Cls sublux cervical spine,unsp	✓	×	×	×
N2117	Subdeltoid bursitis	×	×	✓	✓	S4981	Cls sublux atlanto-occiptl jt	✓	×	×	×
N2118	Bursitis of shoulder	×	×	✓	✓	S4982	Cls sublux atlanto-axial jt	✓	×	×	×
N211z	Painful arc syndrome	×	×	✓	✓	S4983	Closed subluxation C2/C3	✓	×	×	×
N212	Other shoulder affections NEC	×	×	✓	✓	S4984	Closed subluxation C3/C4	✓	×	×	×
N2120	Periarthritis of shoulder	×	×	✓	✓	S4985	Closed subluxation C4/C5	✓	×	×	×

Read Code	Read Term	Axial	Lower Limb	Upper Limb	Clinician Defined	Read Code	Read Term	Axial	Lower Limb	Upper Limb	Clinician Defined
N2121	Scapulohumeral fibrositis	×	×	✓	✓	S4986	Closed subluxation C5/C6	✓	×	×	×
N2122	Subacromial impingement	×	×	✓	✓	S4987	Closed subluxation C6/C7	✓	×	×	×
N2123	Coracoid impingement	×	×	✓	✓	S4988	Closed subluxation C7/T1	✓	×	×	×
N2124	Impingement syndr of shoulder	×	×	✓	✓	S4989	Cl spn sublx+cerv crd lsn,unsp	✓	×	×	×
N2125	Shoulder tendonitis	×	×	✓	✓	S498A	Cl spn sublx+comp cerv crd lsn	✓	×	×	×
N212z	Other shoulder affect.NEC NOS	×	×	✓	✓	S498B	Cl spn sublux+ant cerv crd lsn	✓	×	×	×
N213	Enthesopathy of elbow region	×	×	✓	✓	S498C	Cl spn sublx+cntrl crv crd lsn	✓	×	×	×
N2130	Elbow enthesopathy unspecified	×	×	✓	✓	S498D	Cl spn sublux+post crv crd lsn	✓	×	×	×
N2131	Golfers elbow	×	×	✓	✓	S498x	Cls sublux mlti cerv vertebrae	✓	×	×	×
N2132	Lateral epicondylitis - elbow	×	×	✓	✓	S498z	Cls sublux cerv vertebra NOS	✓	×	×	×
N2133	Olecranon bursitis	×	×	✓	✓	S499	Open sublux cerv spine	✓	×	×	×
N2134	Biceps tendinitis	×	×	✓	✓	S4990	Open sublux cerv spine, unsp	✓	×	×	×
N2135	Triceps tendinitis	×	×	✓	✓	S4991	Opn sublux atlanto-occipitl jt	✓	×	×	×
N213z	Elbow enthesopathy NOS	×	×	✓	✓	S4992	Open sublux atlanto-axial jt	✓	×	×	×
N214	Enthesopathy of wrist/carpus	×	×	✓	✓	S4993	Open subluxation C2/C3	✓	×	×	×
N2140	Bursitis of wrist	×	×	✓	✓	S4994	Open subluxation C3/C4	✓	×	×	×
N2141	Bursitis of hand	×	×	✓	✓	S4995	Open subluxation C4/C5	✓	×	×	×
N2142	Periarthritis of wrist	×	×	✓	✓	S4996	Open subluxation C5/C6	✓	×	×	×
N214z	Wrist/carpus enthesopathy NOS	×	×	✓	✓	S4997	Open subluxation C6/C7	✓	×	×	×
N215	Enthesopathy of hip region	×	✓	×	✓	S4998	Open subluxation C7/T1	✓	×	×	×
N2150	Hip enthesopathy, unspecified	×	✓	×	✓	S4999	Op spn sublx+cerv crd lsn,unsp	✓	×	×	×
N2151	Bursitis of hip	×	✓	×	✓	S499A	Op spn sublx+comp cerv crd lsn	✓	×	×	×
N2152	Gluteal tendinitis	×	✓	×	✓	S499B	Op spn sublux+ant cerv crd lsn	✓	×	×	×
N2153	Iliac crest spur	×	✓	×	✓	S499C	Op spn sublx+cntrl crv crd lsn	✓	×	×	×
N2154	Psoas tendinitis	×	✓	×	✓	S499D	Op spn sublux+post crv crd lsn	✓	×	×	×
N2155	Trochanteric tendinitis	×	✓	×	✓	S499x	Opn sublux mlti cerv vertebrae	✓	×	×	×
N2156	Adductor tendinitis	×	✓	×	✓	S499z	Opn sublux cerv vertebra NOS	✓	×	×	×
N2157	Trochanteric bursitis	×	✓	×	✓	S49A	Cls sublux thrcic+lumbar spine	✓	×	×	×
N2158	Snapping hip	×	✓	×	✓	S49A0	Cls sublux lumbar spine	✓	×	×	×
N2159	Iliotibial band syndrome	×	✓	×	✓	S49A1	Cls sublux thrcic spine	✓	×	×	×
N215A	Ischial bursitis	×	✓	×	✓	S49A2	Cl spn sublx+thrc crd lsn,unsp	✓	×	×	×
N215z	Hip enthesopathy NOS	×	✓	×	✓	S49A3	Cl spn sublx+comp thrc crd lsn	✓	×	×	×
N216	Enthesopathy of knee	×	✓	×	✓	S49A4	Cl spn sublx+ant thrc crd lsn	✓	×	×	×
N2160	Bursitis of knee NOS	×	✓	×	✓	S49A5	Cl spn sublx+cent thrc crd lsn	✓	×	×	×
N2161	Pes anserinus tendin./bursitis	×	✓	×	✓	S49A6	Cl spn sublx+post thrc crd lsn	✓	×	×	×
N2162	Tibial collateral lig.bursitis	×	✓	×	✓	S49A7	Cl spn sublx+lmbr crd lsn,unsp	✓	×	×	×
N2163	Fibular collat.lig.bursitis	×	✓	×	✓	S49A8	Cl spn sublx+comp lmbr crd lsn	✓	×	×	×
N2164	Patellar tendinitis	×	✓	×	✓	S49A9	Cl spn sublx+ant lmbar crd lsn	✓	×	×	×
N2165	Prepatellar bursitis	×	✓	×	✓	S49AA	Cl spn sublx+cent lmbr crd lsn	✓	×	×	×
N2166	Infrapatellar bursitis	×	✓	×	✓	S49AB	Cl spn sublx+post lmbr crd lsn	✓	×	×	×
N2167	Subpatellar bursitis	×	✓	×	✓	S49AC	Cl spn sublx+cauda equina lsn	✓	×	×	×
N2168	Biceps femoris tendinitis	×	✓	×	✓	S49Az	Cls sublux thrc+lmbr spine NOS	✓	×	×	×
N2169	Semimembranosus tendinitis	×	✓	×	✓	S49B	Opn sublux thrcic+lmbr vertbra	✓	×	×	×
N216z	Suprapatellar bursitis	×	✓	×	✓	S49B0	Open subluxation lumbar spine	✓	×	×	×

Read Code	Read Term	Axial	Lower Limb	Upper Limb	Clinician Defined	Read Code	Read Term	Axial	Lower Limb	Upper Limb	Clinician Defined
N217	Tarsus enthesopathy	×	✓	×	✓	S49B1	Opn sublux thoracic spine	✓	×	×	×
N2170	Enthesopathy of ankle unspec.	×	✓	×	✓	S49B2	Op spn sublx+thrc crd lsn,unsp	✓	×	×	×
N2171	Enthesopathy of tarsus unspec.	×	✓	×	✓	S49B3	Op spn sublx+comp thrc crd lsn	✓	×	×	×
N2172	Metatarsalgia NOS	×	✓	×	✓	S49B4	Op spn sublx+ant thrc crd lsn	✓	×	×	×
N2173	Achilles bursitis	×	✓	×	✓	S49B5	Op spn sublx+cent thrc crd lsn	✓	×	×	×
N2174	Achilles tendinitis	×	✓	×	✓	S49B6	Op spn sublx+post thrc crd lsn	✓	×	×	×
N2175	Tibialis anterior tendinitis	×	✓	×	✓	S49B7	Op spn sublx+lmbr crd lsn,unsp	✓	×	×	×
N2176	Tibialis posterior tendinitis	×	✓	×	✓	S49B8	Op spn sublx+comp lmbr crd lsn	✓	×	×	×
N2177	Calcaneal spur	×	✓	×	✓	S49B9	Op spn sublux+ant lmbr crd lsn	✓	×	×	×
N2178	Peroneal tendinitis	×	✓	×	✓	S49BA	Op spn sublx+cent lmbr crd lsn	✓	×	×	×
N2179	Plantar fasciitis	×	✓	×	✓	S49BB	Op spn sublx+post lmbr crd lsn	✓	×	×	×
N217A	Posterior calcaneal exostosis	×	✓	×	✓	S49BC	Op spn sublx+cauda equina lsn	✓	×	×	×
N217B	Anterior ankle impingement	×	✓	×	✓	S49Bz	Op sublx thrc+lmbr vertbra NOS	✓	×	×	×
N217C	Fibular impingement	×	✓	×	✓	S49C	Closed sublux other vertebra	✓	×	×	×
N217z	Ankle/tarsus enthesopathy NOS	×	✓	×	✓	S49C0	Closed sublux spine, unsp	✓	×	×	×
N21y0	Anterior shin splints	×	✓	×	✓	S49C1	Closed subluxation of coccyx	✓	×	×	×
N21y1	Posterior shin splints	×	✓	×	✓	S49C2	Closed subluxation of sacrum	✓	×	×	×
N21z2	Adductor tendonitis	×	✓	×	✓	S49Cz	Closed subluxation spine NOS	✓	×	×	×
N21z3	Bone spur NOS	×	×	×	×	S49D	Open sublux other vertebra	✓	×	×	×
N21z4	Subungual exostosis	×	×	×	×	S49D0	Open sublux spine, unspecified	✓	×	×	×
N21z5	Subungual exostosis great toe	×	✓	×	×	S49D1	Open subluxation of coccyx	✓	×	×	×
N21z6	Subungual exostosis lesser toe	×	✓	×	×	S49D2	Open subluxation of sacrum	✓	×	×	×
N2203	Finger trigger	×	×	✓	×	S49Dz	Open subluxation of spine NOS	✓	×	×	×
N2204	De Quervains disease	×	×	✓	✓	S49E	Other closed traumatic sublux	×	×	×	×
N2205	Other hand/wrist tenosynovitis	×	×	✓	✓	S49E0	Cls trm sublux of sternum	✓	×	×	×
N2206	Tenosynovitis of ankle	×	✓	×	✓	S49E1	Cls trm sublux of pelvis	×	✓	×	×
N2207	Tenosynovitis of foot	×	✓	×	✓	S49E2	Cls trm sublux st-clav jt	×	×	✓	×
N220A	Flexor tenosynovitis of wrist	×	×	✓	✓	S49E3	Cls trm sublux,st-clav jt,ant	×	×	✓	×
N220B	Flexor tenosynovitis of finger	×	×	✓	✓	S49E4	Cls trm sublux,st-clav jt,post	×	×	✓	×
N220C	Flexor tenosynovitis of thumb	×	×	✓	✓	S49E5	Cls trm sublux laryngl cart	✓	×	×	×
N220D	Extensor tenosynovitis of wrist	×	×	✓	✓	S49E6	Cls trm sublux costo-vert jt	✓	×	×	×
N220E	Extensor tenosynovitis-finger	×	×	✓	✓	S49E7	Cls trm sublux costo-chond jt	✓	×	×	×
N220F	Extensor tenosynovitis of thumb	×	×	✓	✓	S49Ez	Oth closed subluxation NOS	×	×	×	×
N220G	Acquired trigger thumb	×	×	✓	×	S49F	Oth open traumatic subluxation	×	×	×	×
N220H	Achilles tenosynovitis	×	✓	×	✓	S49F0	Opn trm sublux of sternum	✓	×	×	×
N220J	Tibialis ant tenosynovitis	×	✓	×	✓	S49F1	Opn trm sublux of pelvis	×	✓	×	×
N220K	Tibialis post tenosynovitis	×	✓	×	✓	S49F2	Opn trm sublux st-clav jt	×	×	✓	×
N220L	Exten hal longus tenosynovitis	×	✓	×	✓	S49F3	Opn trm sublux,st-clav jt,ant	×	×	✓	×
N220M	Exten dig longus tenosynovitis	×	✓	×	✓	S49F4	Opn trm sublux,st-clav jt,post	×	×	✓	×
N220N	Peroneus longus tenosynovitis	×	✓	×	✓	S49F5	Opn trm sublux laryngl cartlge	✓	×	×	×
N220P	Peroneus brevis tenosynovitis	×	✓	×	✓	S49F6	Opn trm sublux costo-verteb jt	✓	×	×	×
N220R	Chron crep synovit hand/wrist	×	×	✓	×	S49F7	Opn trm sublux costo-chond jt	✓	×	×	×
N220S	Synovitis of hip	×	✓	×	✓	S49Fz	Other open subluxation NOS	×	×	×	×
N220z	Synovitis of knee	×	✓	×	✓	S49x	Hand dislocation NOS	×	×	✓	×

Read Code	Read Term	Axial	Lower Limb	Upper Limb	Clinician Defined
N221	Bunion	×	✓	×	×
N2210	Infected bunion	×	✓	×	×
N2220	Beat elbow	×	×	✓	✓
N2221	Beat hand	×	×	✓	✓
N2222	Beat knee	×	✓	×	✓
N2223	Miners' elbow	×	×	✓	✓
N2224	Miners' knee	×	✓	×	✓
N2225	Housemaids knee	×	✓	×	✓
N224*	Ganglion and synovial cyst	×	×	×	×
N2240	Synovial cyst unspecified	×	×	×	×
N2241	Ganglion of joint	×	×	×	×
N2242	Ganglion of tendon sheath	×	×	×	×
N2243	Ganglion unspecified	×	×	×	×
N2244	Cyst of bursa	×	×	×	×
N2245	Ganglion of wrist	×	×	✓	×
N2246	Ganglion of knee	×	✓	×	×
N2247	Ganglion-superior tib-fib jnt	×	✓	×	×
N2248	Ganglion of ankle	×	✓	×	×
N2249	Ganglion,flex tend sheath-fing	×	×	✓	×
N224A	Bakers cyst	×	✓	×	×
N224B	Ganglion of hand	×	×	✓	×
N224C	Ganglion of foot	×	✓	×	×
N224D	Cyst of tendon sheath	×	×	×	×
N224z	Ganglion/synovial cyst NOS	×	×	×	×
N225	Rupture of synovium	×	×	×	×
N2250	Rupture of synovium unspecif.	×	×	×	×
N2251	Rupture of Bakers cyst - knee	×	✓	×	×
N225z	Rupture of synovium NOS	×	×	×	×
N226	Nontraumatic tendon subluxatn	×	×	×	×
N2260	Nontraum.unspec.tendon rupture	×	×	×	×
N2261	Rotator cuff complete rupture	×	×	✓	×
N2262	Biceps tendon rupture	×	×	✓	×
N2263	Hand/wrist extensor tend.rupt.	×	×	✓	×
N2264	Hand/wrist flexor tendon rupt.	×	×	✓	×
N2265	Quadriceps tendon rupture	×	✓	×	×
N2266	Patellar tendon nontraum.rupt.	×	✓	×	×
N2267	Achilles tendon nontraum.rupt.	×	✓	×	×
N2268	Extensor dig communis rupture	×	✓	×	×
N2269	Extensor poll longus rupture	×	×	✓	×
N226A	Long head of biceps rupture	×	×	✓	×
N226B	Subluxation, long head-biceps	×	×	✓	×
N226C	Flex dig sublimis tend rupture	×	×	✓	×
N226D	Flex dig profund tend rupture	×	×	✓	×
N226E	Flex poll long tendon rupture	×	×	✓	×
S49X0	Traum pubic symph separation	×	✓	×	×
S49z	Other dislocation NOS	×	×	×	×
S4A	#-dslc or subluxation shoulder	×	×	✓	×
S4A0	Closed #-dslc shoulder	×	×	✓	×
S4A00	Closed #-dslc shoulder joint	×	×	✓	×
S4A01	Closed #-dslc acrom-clav joint	×	×	✓	×
S4A1	Open #-dslc shoulder	×	×	✓	×
S4A10	Open #-dslc shoulder joint	×	×	✓	×
S4A11	Open #-dslc acrom-clav joint	×	×	✓	×
S4A2	Closed #-sublux shoulder	×	×	✓	×
S4A20	Closed #-sublux shoulder joint	×	×	✓	×
S4A21	Closed #-sublux acrom-clav jt	×	×	✓	×
S4A3	Open #-sublux shoulder	×	×	✓	×
S4A30	Open #-sublux shoulder joint	×	×	✓	×
S4A31	Open #-sublux acrom-clav joint	×	×	✓	×
S4B	#-dslc/subluxation elbow	×	×	✓	×
S4B0	Closed #-dislocation elbow	×	×	✓	×
S4B00	Closed #-dslc elbow joint	×	×	✓	×
S4B01	Cl #-disl sup rad-ulnar joint	×	×	✓	×
S4B1	Open #-dislocation elbow	×	×	✓	×
S4B10	Open #-dislocation elbow joint	×	×	✓	×
S4B11	Op #-discl sup rad-ulnar joint	×	×	✓	×
S4B2	Closed #-sublux elbow	×	×	✓	×
S4B20	Closed #-sublux elbow joint	×	×	✓	×
S4B21	Cl #-sublx sup rad-ulnar joint	×	×	✓	×
S4B3	Open #-sublux elbow	×	×	✓	×
S4B30	Open #-sublux elbow joint	×	×	✓	×
S4B31	Op #-sublx sup rad-ulnar joint	×	×	✓	×
S4C	#-dslc/subluxation of wrist	×	×	✓	×
S4C0	Closed fracture dslc of wrist	×	×	✓	×
S4C00	Cl #-disl distal rad-uln joint	×	×	✓	×
S4C01	Closed #-dsl radiocarpal joint	×	×	✓	×
S4C02	Closed #-dslc mid carpal	×	×	✓	×
S4C03	Closed #-dslc CMCJ	×	×	✓	×
S4C04	Closed #-dslc lunate (volar)	×	×	✓	×
S4C05	Closed #-dslc pri-lun(dors)	×	×	✓	×
S4C06	Cls #-dslc pri-lun trans-scphd	×	×	✓	×
S4C0y	Closed #-dslc other carpal	×	×	✓	×
S4C1	Open fracture dslc wrist	×	×	✓	×
S4C10	Open #-disl dstl rad-uln joint	×	×	✓	×
S4C11	Open #-disloc radiocarpal jnt	×	×	✓	×
S4C12	Open #-dslc mid carpal	×	×	✓	×
S4C13	Open #-dslc CMCJ	×	×	✓	×
S4C14	Open #-dslc lunate (volar)	×	×	✓	×

Read Code	Read Term	Axial	Lower Limb	Upper Limb	Clinician Defined	Read Code	Read Term	Axial	Lower Limb	Upper Limb	Clinician Defined
N226F	Tibialis posterior rupture	×	✓	×	×	S4C15	Open #-dslc pri-lun(dors)	×	×	✓	×
N226G	Peroneus longus rupture	×	✓	×	×	S4C16	Opn #-dslc pri-lun trns-scaphd	×	×	✓	×
N226H	Subluxation of peroneal tendon	×	✓	×	×	S4C1y	Open #-dslc other carpal	×	×	✓	×
N226J	Subluxation tendon wrist/hand	×	×	✓	×	S4C2	Closed #-sublux of the wrist	×	×	✓	×
N226K	Dislocation tendon wrist/hand	×	×	✓	×	S4C20	Cl #-sblx distal rad-uln joint	×	×	✓	×
N226L	Bowstringing tendon wrist/hand	×	×	✓	×	S4C21	Closed #-sublx radcarpal joint	×	×	✓	×
N226y	Other foot/ankle tendon rupt.	×	✓	×	×	S4C22	Closed #-sublux mid carpal	×	×	✓	×
N226z	Other nontraumatic tendon rupt	×	×	×	×	S4C23	Closed #-sublux CMCJ	×	×	✓	×
N22y0	Short Achilles tendon	×	✓	×	×	S4C24	Closed #-sublux lunate (volar)	×	×	✓	×
N22y1	Calcification of tendon NOS	×	×	×	×	S4C25	Cls #-sublux pri-lun (dorsal)	×	×	✓	×
N22y2	Abscess of tendon	×	×	×	×	S4C26	Cls #-sublux pri-lun trns-scph	×	×	✓	×
N22y3	Abscess of bursa	×	×	×	×	S4C2y	Closed #-sublux other carpal	×	×	✓	×
N22y4	Synovial plica of knee	×	✓	×	×	S4C3	Open #-sublux of the wrist	×	×	✓	×
N22y5	Short tendon	×	×	×	×	S4C30	Open #-sblx,dist rad-uln joint	×	×	✓	×
N22y6	Abscess of tendon-arm	×	×	✓	×	S4C31	Open #-sublux radcarpal joint	×	×	✓	×
N22y7	Abscess of tendon-forearm	×	×	✓	×	S4C32	Open #-sublux mid carpal	×	×	✓	×
N22y8	Abscess of tendon-hand	×	×	✓	×	S4C33	Open #-sublux CMCJ	×	×	✓	×
N22y9	Abscess of tendon-thigh	×	✓	×	×	S4C34	Open #-sublux lunate (volar)	×	×	✓	×
N22yA	Abscess of tendon-leg	×	✓	×	×	S4C35	Open #-sublux pri-lun (dorsal)	×	×	✓	×
N22yB	Abscess of tendon-foot	×	✓	×	×	S4C36	Op #-sublux pri-lun trns-scph	×	×	✓	×
N22yC	Pyogenic infec - tendon sheath	×	×	×	×	S4C3y	Open #-sublux other carpal	×	×	✓	×
N22yD	Tuberc infec - tendon sheath	×	×	×	×	S4D	#-dslc/sublux finger/thumb	×	×	✓	×
N22yE	Abscess of bursa-shoulder	×	×	✓	×	S4D0	Closed #-disloc digit	×	×	✓	×
N22yF	Abscess of bursa-elbow	×	×	✓	×	S4D00	Closed #-disloc digit, unsp	×	×	✓	×
N22yG	Abscess of bursa-wrist	×	×	✓	×	S4D01	Closed #-disloc MPJ	×	×	✓	×
N22yH	Abscess of bursa-hip	×	✓	×	×	S4D02	Closed #-disloc IPJ, unsp	×	×	✓	×
N22yJ	Abscess of bursa-knee	×	✓	×	×	S4D03	Closed #-disloc DIPJ	×	×	✓	×
N22yK	Abscess of bursa-ankle	×	✓	×	×	S4D04	Closed #-disloc PIPJ	×	×	✓	×
N22yL	Abscess of bursa-foot	×	✓	×	×	S4D05	Closed #-disloc IPJ thumb	×	×	✓	×
N22yM	Short Achilles tend - acquired	×	✓	×	×	S4D06	Closed #-dslc multiple digits	×	×	✓	×
N22yN	Achilles degeneration	×	✓	×	×	S4D1	Open #-disloc digit	×	×	✓	×
N2300	Infective myositis-neck	✓	×	×	×	S4D10	Open #-disloc digit, unsp	×	×	✓	×
N2301	Infective myositis-back	✓	×	×	×	S4D11	Open #-disloc MPJ	×	×	✓	×
N2302	Infective myositis-shoulder	×	×	✓	×	S4D12	Open #-disloc IPJ, unsp	×	×	✓	×
N2303	Infective myositis-arm	×	×	✓	×	S4D13	Open #-disloc DIPJ	×	×	✓	×
N2304	Infective myositis-forearm	×	×	✓	×	S4D14	Open #-disloc PIPJ	×	×	✓	×
N2305	Infective myositis-hand	×	×	✓	×	S4D15	Open #-disloc IPJ thumb	×	×	✓	×
N2306	Infective myositis-pelvis	×	✓	×	×	S4D16	Open #-dslc multiple digits	×	×	✓	×
N2307	Infective myositis-thigh	×	✓	×	×	S4D2	Closed #-sublux digit	×	×	✓	×
N2308	Infective myositis-leg	×	✓	×	×	S4D20	Closed #-sublux digit, unsp	×	×	✓	×
N2309	Infective myositis-foot	×	✓	×	×	S4D21	Closed #-sublux MPJ	×	×	✓	×
N230A	Muscle abscess	×	×	×	×	S4D22	Closed #-sublux IPJ, unsp	×	×	✓	×
N230B	Muscle abscess-neck	✓	×	×	×	S4D23	Closed #-sublux DIPJ	×	×	✓	×
N230C	Muscle abscess-back	✓	×	×	×	S4D24	Closed #-sublux PIPJ	×	×	✓	×

Read Code	Read Term	Axial	Lower Limb	Upper Limb	Clinician Defined	Read Code	Read Term	Axial	Lower Limb	Upper Limb	Clinician Defined
N230D	Muscle abscess-shoulder	×	×	✓	×	S4D25	Closed #-sublux IPJ thumb	×	×	✓	×
N230E	Muscle abscess-arm	×	×	✓	×	S4D26	Cls #-subluxation mlti digits	×	×	✓	×
N230F	Muscle abscess-forearm	×	×	✓	×	S4D3	Open #-subluxation digit	×	×	✓	×
N230G	Muscle abscess-hand	×	×	✓	×	S4D30	Open #-subluxation digit, unsp	×	×	✓	×
N230H	Muscle abscess-pelvis	×	✓	×	×	S4D31	Open #-subluxation MPJ	×	×	✓	×
N230J	Muscle abscess-thigh	×	✓	×	×	S4D32	Open #-subluxation IPJ, unsp	×	×	✓	×
N230K	Muscle abscess-leg	×	✓	×	×	S4D33	Open #-subluxation DIPJ	×	×	✓	×
N230L	Muscle abscess-foot	×	✓	×	×	S4D34	Open #-subluxation PIPJ	×	×	✓	×
N236	Dupuytrens contracture	×	×	✓	×	S4D35	Open #-subluxation IPJ thumb	×	×	✓	×
N2360	Dupuytren's disease of palm	×	×	✓	×	S4D36	Open #-sublux multiple digits	×	×	✓	×
N2361	Dupuyt dis-palm + nod no cont	×	×	✓	×	S4E	#-dslc/subluxation hip	×	✓	×	×
N2362	Dupuyt dis-palm + contracture	×	×	✓	×	S4E0	Closed #-dslc, hip joint	×	✓	×	×
N2363	Dupuytren's disease-finger(s)	×	×	✓	×	S4E1	Open #-dslc, hip joint	×	✓	×	×
N2364	Dupuyt dis-fing + nod, no cont	×	×	✓	×	S4E2	Closed #-sublux, hip joint	×	✓	×	×
N2365	Dupuyt dis-finger(s) + contrac	×	×	✓	×	S4E3	Open #-sublux, hip joint	×	✓	×	×
N2366	Dupuyt dis-palm and finger(s)	×	×	✓	×	S4F	#-dslc/subluxation knee	×	✓	×	×
N2367	Dup dis,palm+fing,+nod,no cont	×	×	✓	×	S4F0	Closed #-dslc, knee joint	×	✓	×	×
N2368	Dup dis,palm+fing,+contracture	×	×	✓	×	S4F1	Open #-dslc, knee joint	×	✓	×	×
N2370	Plantar fascial fibromatosis	×	✓	×	×	S4F2	Closed #-sublux, knee joint	×	✓	×	×
N2371	Knuckle pads	×	×	✓	×	S4F3	Open #-sublux, knee joint	×	✓	×	×
N2380	Contracture - pectoralis major	✓	×	×	×	S4F4	Cls #-dslc,patello-fem jt	×	✓	×	×
N2381	Contracture of triceps	×	×	✓	×	S4F5	Open #-dslc,patello-fem jt	×	✓	×	×
N2382	Contracture of biceps	×	×	✓	×	S4F6	Cls #-sublux,patello-fem jt	×	✓	×	×
N2383	Contracture of wrist flexor(s)	×	×	✓	×	S4F7	Open #-sublux,patello-fem jt	×	✓	×	×
N2384	Contracture - wrist extensor	×	×	✓	×	S4G	#-dslc/subluxation ankle	×	✓	×	×
N2385	Contracture - flex poll longus	×	×	✓	×	S4G0	Closed #-dslc, ankle joint	×	✓	×	×
N2386	Contracture - thumb extensor	×	×	✓	×	S4G1	Open #-dslc, ankle joint	×	✓	×	×
N2387	Contracture-flex dig superfic	×	×	✓	×	S4G2	Closed #-sublux, ankle joint	×	✓	×	×
N2388	Contracture - flex dig profund	×	×	✓	×	S4G3	Open #-sublux, ankle joint	×	✓	×	×
N2389	Contracture-adductor pollicis	×	×	✓	×	S4H	#-dslc/subluxation foot	×	✓	×	×
N238A	Contract-oth intrin musc-hand	×	×	✓	×	S4H0	Closed #-dislocation foot	×	✓	×	×
N238B	Contracture of iliopsoas	×	✓	×	×	S4H00	Closed #-dslc, subtalar joint	×	✓	×	×
N238C	Contracture of rectus femoris	×	✓	×	×	S4H01	Closed #-dslc midtarsal jt	×	✓	×	×
N238D	Contracture-adductor musc-hip	×	✓	×	×	S4H02	Cls #-dslc,tarsometatarsal jt	×	✓	×	×
N238E	Contracture-abductor musc-hip	×	✓	×	×	S4H03	Cls #-dslc,metatrsphln jt,sgl	×	✓	×	×
N238F	Contracture of hamstring(s)	×	✓	×	×	S4H04	Cls #-dslc,interphln jt,single	×	✓	×	×
N238G	Contracture of quadriceps	×	✓	×	×	S4H05	Cls #-dslc,mtatrsophln jt,mlti	×	✓	×	×
N238H	Contracture of tendo achilles	×	✓	×	×	S4H06	Cls #-dslc,interphln jt,mlti	×	✓	×	×
N238J	Contracture-tibialis anterior	×	✓	×	×	S4H1	Open #-dslc, foot	×	✓	×	×
N238K	Contracture-tibialis posterior	×	✓	×	×	S4H10	Open #-dslc, subtalar joint	×	✓	×	×
N238L	Contracture-long toe flexor	×	✓	×	×	S4H11	Open #-dslc, midtarsal joint	×	✓	×	×
N238M	Contracture-long toe extensor	×	✓	×	×	S4H12	Open #-dslc,tarsometatarsal jt	×	✓	×	×
N238N	Contracture-intrin muscle-foot	×	✓	×	×	S4H13	Op #-dslc,mtatrsphln jt,single	×	✓	×	×
N23y2	Nontraumatic muscle rupture	×	×	×	×	S4H14	Op #-dslc,interphln jt,single	×	✓	×	×

Read Code	Read Term	Axial	Lower Limb	Upper Limb	Clinician Defined
N23y3	Divarication of recti	×	×	×	×
N23y6	Palmar space infecn, thenar	×	×	✓	×
N23y7	Palmar space infecn, mid-palm	×	×	✓	×
N23y8	Palmar space infecn,hypo-thena	×	×	✓	×
N23yA	Diastasis of muscle	×	×	×	×
N23yB	Ischaemic infarction of muscle	×	×	×	×
N23yD	Muscle strain	×	×	×	×
N23yE	Spasm of back muscles	✓	×	×	✓
N2405	Fibrositis of neck	✓	×	×	✓
N2406	Fibrositis arm	×	×	✓	✓
N2407	Hand rheumatism	×	×	✓	✓
N2410*	Intercostal myalgia	×	✓	✓	✓
N2431	Hypertrophy of knee fat pad	×	✓	×	×
N245*	Ankle pain	×	×	×	✓
N2450	Finger pain	×	×	✓	✓
N2451	Foot pain	×	✓	×	✓
N2452	Aching leg syndrome	×	✓	×	✓
N2453	Pain in arm	×	×	✓	✓
N2454	Calf pain	×	✓	×	✓
N2455	Axillary pain	×	×	✓	✓
N2456	Tender heel pad	×	✓	×	✓
N2457	Shoulder pain	×	×	✓	✓
N2459	Pain in buttock	×	✓	×	✓
N2470	Swelling of calf	×	✓	×	×
N2471*	Leg cramps	×	×	×	✓
N247z*	Hand cramps	×	×	×	✓
N3000	Acute osteomyelitis-site unsp.	×	×	×	×
N3001	Acute osteomyelitis-shoulder	×	×	✓	×
N3002	Acute osteomyelitis-upper arm	×	×	✓	×
N3003	Acute osteomyelitis-forearm	×	×	✓	×
N3004	Acute osteomyelitis-hand	×	×	✓	×
N3005	Thigh acute osteomyelitis	×	✓	×	×
N3006	Acute osteomyelitis-lower leg	×	✓	×	×
N3007	Foot - acute osteomyelitis	×	✓	×	×
N300A	Acute osteomyelitis-cerv spine	✓	×	×	×
N300B	Acute osteomyelitis-thor spine	✓	×	×	×
N300C	Acute osteomyelitis-lumb spine	✓	×	×	×
N300D	Acute osteomyelitis-sacrum	✓	×	×	×
N300E	Acute osteomyelitis-coccyx	✓	×	×	×
N300F	Acute osteomyelitis-clavicle	×	×	✓	×
N300G	Acute osteomyelitis-scapula	×	×	✓	×
N300H	Acute osteomyelitis-humerus	×	×	✓	×
N300J	Acute osteomyelitis-radius	×	×	✓	×
N300K	Acute osteomyelitis-ulna	×	×	✓	×
S4H15	Opn #-dslc,metatrsphln jt,mlti	×	✓	×	×
S4H16	Open #-dslc,interphln jt,mlti	×	✓	×	×
S4H2	Closed #-sublux, foot	×	✓	×	×
S4H20	Closed #-sublux, subtalar jt	×	✓	×	×
S4H21	Closed #-sublux, midtarsal jt	×	✓	×	×
S4H22	Cls #-sublux,tarsometatarsl jt	×	✓	×	×
S4H23	Cl #-sublx,metatrsphln jt,sng	×	✓	×	×
S4H24	Cl #-sublux,interphln jt,sngle	×	✓	×	×
S4H25	Cl #-sublux,mtatrsphln jt,mlti	×	✓	×	×
S4H26	Cls #-sublux,interphln jt,mlti	×	✓	×	×
S4H3	Open #-sublux, foot	×	✓	×	×
S4H30	Open #-sublux, subtalar joint	×	✓	×	×
S4H31	Open #-sublux,midtarsal jt	×	✓	×	×
S4H32	Op #-sublux,tarsometatarsal jt	×	✓	×	×
S4H33	Op #-sublux,MTP joint,single	×	✓	×	×
S4H34	Opn #-sublux,interphln jt,sng	×	✓	×	×
S4H35	Op #-sublx,mtatrsphln jt,mlti	×	✓	×	×
S4H36	Opn #-sublux,interphln jt,mlti	×	✓	×	×
S4J	Other #-dslc or subluxation	×	×	×	×
S4J0	Other closed #-dislocation	×	×	×	×
S4J00	Closed #-dslc of sternum	✓	×	×	×
S4J01	Closed #-dslc of pelvis	×	✓	×	×
S4J02	Cls #-dslc st-clav jt,ant	×	×	✓	×
S4J03	Cls #-dslc st-clav jt,post	×	×	✓	×
S4J1	Other open #-dislocation	×	×	×	×
S4J10	Open #-dslc of sternum	✓	×	×	×
S4J11	Open #-dslc of pelvis	×	✓	×	×
S4J12	Open #-dslc st-clav jt,ant	×	×	✓	×
S4J13	Open #-dslc st-clav jt,post	×	×	✓	×
S4J2	Other closed #-sublux	×	×	×	×
S4J20	Closed #-sublux of sternum	✓	×	×	×
S4J21	Closed #-sublux of pelvis	×	✓	×	×
S4J22	Cls #-sublux st-clav jt,ant	×	×	✓	×
S4J23	Cls #-sublux st-clav jt,post	×	×	✓	×
S4J3	Other open #-subluxation	×	×	×	×
S4J30	Open #-sublux of sternum	✓	×	×	×
S4J31	Open #-sublux of pelvis	×	✓	×	×
S4J32	Open #-sublux st-clav jt,ant	×	×	✓	×
S4J33	Open #-sublux st-clav jt,post	×	×	✓	×
S4z	Dislocation or subluxation NOS	×	×	×	×
S50	Sprain shoulder/upper arm	×	×	✓	×
S500	Sprain acromio-clav ligament	×	×	✓	×
S501	Sprain, coraco-clav ligament	×	×	✓	×
S502	Coracohumeral sprain	×	×	✓	×

Read Code	Read Term	Axial	Lower Limb	Upper Limb	Clinician Defined	Read Code	Read Term	Axial	Lower Limb	Upper Limb	Clinician Defined
N300L	Acute osteomyelitis-carp bone	×	×	✓	×	S503	Sprain infraspinatus tendon	×	×	✓	×
N300M	Acute osteomyelitis-metacarpal	×	×	✓	×	S504	Rotator cuff sprain	×	×	✓	×
N300N	Acute osteomyelit-phal fing/th	×	×	✓	×	S505	Sprain, subscapularis tendon	×	×	✓	×
N300P	Acute osteomyelitis-pelvis	×	✓	×	×	S506	Sprain, supraspinatus tendon	×	×	✓	×
N300Q	Acute osteomyelitis-femur	×	✓	×	×	S507	Sprain shoulder joint	×	×	✓	×
N300R	Acute osteomyelitis-patella	×	✓	×	×	S5070	Sprain,shoulder joint,anterior	×	×	✓	×
N300S	Acute osteomyelitis-tibia	×	✓	×	×	S5071	Sprain,shoulder jnt,posterior	×	×	✓	×
N300T	Acute osteomyelitis-fibula	×	✓	×	×	S508	Sprain biceps tendon	×	×	✓	×
N300U	Acute osteomyelitis-calcaneum	×	✓	×	×	S509	Sprain,long head biceps tendon	×	×	✓	×
N300V	Acute osteomyelitis-talus	×	✓	×	×	S50A	Sprain triceps tendon	×	×	✓	×
N300W	Acute osteomyelitis oth tarsal	×	✓	×	×	S50w	Shoulder strain	×	×	✓	×
N300X	Acute osteomyelitis-metatarsal	×	✓	×	×	S50x	Other upper arm sprain	×	×	✓	×
N300Y	Acute osteomyelitis-phal toe	×	✓	×	×	S50X	Spr/str oth/un part shl gir	×	×	✓	×
N3011	Chron.osteomyelitis-shoulder	×	×	✓	×	S50y	Shoulder sprain NOS	×	×	✓	×
N3012	Chron.osteomyelitis-upper arm	×	×	✓	×	S50z	Upper arm sprain NOS	×	×	✓	×
N3013	Chron.osteomyelitis-forearm	×	×	✓	×	S51	Forearm sprain	×	×	✓	×
N3014	Chron.osteomyelitis-hand	×	×	✓	×	S510	Sprn,elbw jt,rdl clltrl lgmnt	×	×	✓	×
N3015	Thigh - chronic osteomyelitis	×	✓	×	×	S511	Sprn,elbw jt,uln clltrl lgmnt	×	×	✓	×
N3016	Chron.osteomyelitis-lower leg	×	✓	×	×	S512	Radiohumeral sprain	×	×	✓	×
N3017	Foot - chronic osteomyelitis	×	✓	×	×	S513	Ulnohumeral sprain	×	×	✓	×
N301A	Chronic osteomyelitis-Cx spine	✓	×	×	×	S51w	Other elbow sprain	×	×	✓	×
N301B	Chronic osteomyelitis-th spine	✓	×	×	×	S51x	Other forearm sprain	×	×	✓	×
N301C	Chronic osteomyelitis-lu spine	✓	×	×	×	S51y	Elbow sprain NOS	×	×	✓	×
N301D	Chronic osteomyelitis-sacrum	✓	×	×	×	S51z	Forearm sprain NOS	×	×	✓	×
N301E	Chronic osteomyelitis-coccyx	✓	×	×	×	S52	Sprain of wrist and hand	×	×	✓	×
N301F	Brodie's abscess-cervic spine	✓	×	×	×	S520	Sprain wrist ligament	×	×	✓	×
N301G	Brodie's abscess-thorac spine	✓	×	×	×	S5200	Wrist sprain unspecified	×	×	✓	×
N301H	Brodie's abscess-lumbar spine	✓	×	×	×	S5201	Carpal joint sprain	×	×	✓	×
N301J	Brodie's abscess-sacrum	✓	×	×	×	S5202	Sprn prox radcrp lgmnt non-sp	×	×	✓	×
N301K	Brodie's abscess-coccyx	✓	×	×	×	S5203	Distal radioulnar joint sprain	×	×	✓	×
N3020	Unsp.osteomyelitis-site unspec	×	×	×	×	S5204	Sprn radial collateral lgmnt	×	×	✓	×
N3021	Unsp.osteomyelitis-shoulder	×	×	✓	×	S5205	Sprn volar rad-carp lig non-sp	×	×	✓	×
N3022	Unsp.osteomyelitis-upper arm	×	×	✓	×	S5206	Sprn volar rad-carp lig sprfcl	×	×	✓	×
N3023	Unsp.osteomyelitis-forearm	×	×	✓	×	S5207	Sprn radio-scapho-cptate lgmnt	×	×	✓	×
N3024	Unsp.osteomyelitis-hand	×	×	✓	×	S5208	Sprain radio-lunate ligament	×	×	✓	×
N3025	Unsp.osteomyelitis-pelv/thigh	×	✓	×	×	S5209	Sprn radio-scapho-lunate lgmnt	×	×	✓	×
N3026	Unsp.osteomyelitis-lower leg	×	✓	×	×	S520A	Sprn dorsal radio-carpal lgmnt	×	×	✓	×
N3027	Unsp.osteomyelitis-ankle/foot	×	✓	×	×	S520B	Sprn ulnr carpal complx non-sp	×	×	✓	×
N302a	Osteomyelitis of vertebra	✓	×	×	×	S520C	Sprain ulnar-carpal meniscus	×	×	✓	×
N302A	Infection of cervical spine	✓	×	×	×	S520D	Sprn triangular fibrocartilage	×	×	✓	×
N302B	Infection of thoracic spine	✓	×	×	×	S520E	Sprain ulno-lunate ligament	×	×	✓	×
N302C	Infection of lumbar spine	✓	×	×	×	S520F	Sprn ulnar collateral lgmnt	×	×	✓	×
N302D	Infection of sacrum	✓	×	×	×	S520G	Sprn shrt intrnsc lgmnt non-sp	×	×	✓	×
N302E	Infection of coccyx	✓	×	×	×	S520H	Sprn scapho-trapezium lgmnt	×	×	✓	×

Read Code	Read Term	Axial	Lower Limb	Upper Limb	Clinician Defined	Read Code	Read Term	Axial	Lower Limb	Upper Limb	Clinician Defined
N302F	Infection of clavicle	×	×	✓	×	S520J	Sprn luno-triquetral lgmnt	×	×	✓	×
N302G	Infection of scapula	×	×	✓	×	S520K	Sprain scapho-lunate ligament	×	×	✓	×
N302H	Infection of humerus	×	×	✓	×	S520L	Sprn volar intrcrp/V lgmnt	×	×	✓	×
N302J	Infection of radius	×	×	✓	×	S520M	Sprn dorsal intercarpal lgmnt	×	×	✓	×
N302K	Infection of ulna	×	×	✓	×	S520z	Wrist sprain NOS	×	×	✓	×
N302L	Infection of carpal bone	×	×	✓	×	S521	Hand sprain	×	×	✓	×
N302M	Infection of metacarpal	×	×	✓	×	S5210	Finger sprain	×	×	✓	×
N302N	Infectn of phalanx finger/thum	×	×	✓	×	S5211	Carpometacarpal sprain	×	×	✓	×
N302P	Infection of pelvis	×	✓	×	×	S5212	Metacarpophalangeal sprain	×	×	✓	×
N302Q	Infection of femur	×	✓	×	×	S5213	Interphalangeal sprain	×	×	✓	×
N302R	Infection of patella	×	✓	×	×	S5214	Midcarpal joint sprain	×	×	✓	×
N302S	Infection of tibia	×	✓	×	×	S521z	Hand sprain NOS	×	×	✓	×
N302T	Infection of fibula	×	✓	×	×	S522	Sprain thumb	×	×	✓	×
N302U	Infection of calcaneum	×	✓	×	×	S5220	Sprain thumb C.M.C.J	×	×	✓	×
N302V	Infection of talus	×	✓	×	×	S5221	Sprn thumb MCPJ non specific	×	×	✓	×
N302W	Infection of other tarsal bone	×	✓	×	×	S5222	Sprn thmb MCPJ rdl collat lgmt	×	×	✓	×
N302X	Infection of metatarsal	×	✓	×	×	S5223	Sprn thmb MCPJ uln collat lgmt	×	×	✓	×
N302Y	Infection of phalanx of toe	×	✓	×	×	S5224	Sprn thumb IPJ non specific	×	×	✓	×
N3030	Periostitis - site unspecified	×	×	×	×	S5225	Sprn thmb IPJ rdl collat lgmt	×	×	✓	×
N3031	Periostitis - shoulder	×	×	✓	×	S5226	Sprn thmb IPJ uln collat lgmnt	×	×	✓	×
N3032	Periostitis - upper arm	×	×	✓	×	S523	Sprain finger	×	×	✓	×
N3033	Periostitis - forearm	×	×	✓	×	S5230	Sprain finger C.M.C.J.	×	×	✓	×
N3034	Periostitis - hand	×	×	✓	×	S5231	Sprn finger MCPJ non specific	×	×	✓	×
N3035	Periostitis - pelvic/thigh	×	✓	×	×	S5232	Sprn fngr MCPJ rdl collat lgmt	×	×	✓	×
N3036	Periostitis - lower leg	×	✓	×	×	S5233	Sprn fngr MCPJ uln collat lgmt	×	×	✓	×
N3037	Periostitis - ankle/foot	×	✓	×	×	S5234	Sprn finger PIPJ non specific	×	×	✓	×
N303A	Periostitis, no osteomye-Cx sp	✓	×	×	×	S5235	Sprn fngr PIPJ rdl collat lgmt	×	×	✓	×
N303B	Periostitis, no osteomye-th sp	✓	×	×	×	S5236	Sprn fngr PIPJ uln collat lgmt	×	×	✓	×
N303C	Periostitis, no osteomye-lu sp	✓	×	×	×	S5237	Sprn finger DIPJ non specific	×	×	✓	×
N303D	Periostitis, no osteomye-sacr	✓	×	×	×	S5238	Sprn fngr DIPJ rdl collat lgmt	×	×	✓	×
N303E	Periostitis, no osteomye-coccy	✓	×	×	×	S5239	Sprn fngr DIPJ uln collat lgmt	×	×	✓	×
N304	Tuberculosis of spine (Pott's)	✓	×	×	×	S523A	Volar plate injury finger MCPJ	×	×	✓	×
N3040	Tuberculosis of cervical spine	✓	×	×	×	S523B	Volar plate injury finger PIPJ	×	×	✓	×
N3041	Tuberculosis of thoracic spine	✓	×	×	×	S523C	Volar plate injury finger DIPJ	×	×	✓	×
N3042	Tuberculosis of lumbar spine	✓	×	×	×	S523D	Volar plate injury thumb MCPJ	×	×	✓	×
N3043	Tuberculosis of sacrum/coccyx	✓	×	×	×	S523E	Volar plate injury thumb IPJ	×	×	✓	×
N305	Tuberculosis of limb bones	×	×	×	×	S523F	Hyperextension injury of finger	×	×	✓	×
N3050	Tuberculosis-limb bone unspec.	×	×	×	×	S524	Sprain tendon wrist or hand	×	×	✓	×
N3051	Tuberculosis-upper arm bone	×	×	✓	×	S5240	Sprain wrist extensors	×	×	✓	×
N3052	Tuberculosis-forearm bone	×	×	✓	×	S5241	Sprain wrist flexors	×	×	✓	×
N3053	Tuberculosis-pelvic/thigh bone	×	✓	×	×	S525	Sprain tendon of thumb	×	×	✓	×
N3054	Tuberculosis-lower leg bone	×	✓	×	×	S5250	Sprn,flxr pollicis longus tndn	×	×	✓	×
N3055	Tuberculosis-other limb bones	×	×	×	×	S5251	Sprn,extnsr pollicis long tndn	×	×	✓	×
N3056	Tuberculosis-multipl.limb bone	×	×	×	×	S526	Sprain tendon of finger	×	×	✓	×

Read Code	Read Term	Axial	Lower Limb	Upper Limb	Clinician Defined	Read Code	Read Term	Axial	Lower Limb	Upper Limb	Clinician Defined
N305z	Tuberculosis limb bones NOS	×	×	×	×	S5260	Sprn,flxr digit superfic tndn	×	×	✓	×
N3060	Tuberculosis bone-site unspec.	×	×	×	×	S5261	Sprn,flxr digit profundus tndn	×	×	✓	×
N3061	Tuberculosis bone-shoulder	×	×	✓	×	S5262	Sprn,extnsr digitorum tendon	×	×	✓	×
N3062	Tuberculosis bone-hand	×	×	✓	×	S52z	Wrist and hand sprain NOS	×	×	✓	×
N3063	Tuberculosis bone-ankle/foot	×	✓	×	×	S53	Groin sprain	×	✓	×	×
N3070	Polio.osteopathy-site unspecif	×	×	×	×	S530	Iliofemoral sprain	×	✓	×	×
N3071	Polio.osteopathy-shoulder	×	×	✓	×	S531	Ischiocapsular sprain	×	✓	×	×
N3072	Polio.osteopathy-upper arm	×	×	✓	×	S532	Sprain, hip joint	×	✓	×	×
N3073	Polio.osteopathy-forearm	×	×	✓	×	S533	Sprain quadriceps tendon	×	✓	×	×
N3074	Polio.osteopathy-hand	×	×	✓	×	S534	Sprain patellar tendon	×	✓	×	×
N3075	Polio.osteopathy-pelvic/thigh	×	✓	×	×	S535	Sprain, hamstring tendon	×	✓	×	×
N3076	Polio.osteopathy-lower leg	×	✓	×	×	S53w	Other hip sprain	×	✓	×	×
N3077	Polio.osteopathy-ankle/foot	×	✓	×	×	S53x	Other thigh sprain	×	✓	×	×
N3080	Subacute osteomyelitis-Cx spin	✓	×	×	×	S53y	Hip sprain NOS	×	✓	×	×
N3081	Subacute osteomyelitis-th spin	✓	×	×	×	S53z	Thigh sprain NOS	×	✓	×	×
N3082	Subacute osteomyelitis-lu spin	✓	×	×	×	S54	Knee sprain	×	✓	×	×
N3083	Subacute osteomyelitis-sacrum	✓	×	×	×	S540	Sprn/prt tr,knee,lat coll lgmt	×	✓	×	×
N3084	Subacute osteomyelitis-coccyx	✓	×	×	×	S5400	Sprn,knee jt,lat collat lgmt	×	✓	×	×
N30y1	Oth.inf.+bone dis-shoulder	×	×	✓	×	S5401	Part tear,knee,lat collat lgmt	×	✓	×	×
N30y2	Oth.inf.+bone dis-upper arm	×	×	✓	×	S541	Sprain med.collateral lig.knee	×	✓	×	×
N30y3	Oth.inf.+bone dis-forearm	×	×	✓	×	S5410	Sprn,knee jt,medial collat	×	✓	×	×
N30y4	Oth.inf.+bone dis-hand	×	×	✓	×	S5411	Part tear,knee,mdl collat lgmt	×	✓	×	×
N30y5	Oth.inf.+bone dis-pelvic/thigh	×	✓	×	×	S542	Sprain cruciate ligament knee	×	✓	×	×
N30y6	Oth.inf.+bone dis-lower leg	×	✓	×	×	S5421	Part tr,knee,ant cruciate lgmt	×	✓	×	×
N30y7	Oth.inf.+bone dis-ankle/foot	×	✓	×	×	S5422	Prt tr,knee,post cruciate lgmt	×	✓	×	×
N30z1	Bone infectn.NOS-shoulder	×	×	✓	×	S543	Sprain superior tibiofibular	×	✓	×	×
N30z2	Bone infectn.NOS-upper arm	×	×	✓	×	S544	Sprain plantaris tendon	×	✓	×	×
N30z3	Bone infectn.NOS-forearm	×	×	✓	×	S54w	Other specified knee sprain	×	✓	×	×
N30z4	Bone infectn.NOS-hand	×	×	✓	×	S54x	Other specified leg sprain	×	✓	×	×
N30z5	Bone infectn.NOS-pelvic/thigh	×	✓	×	×	S54x1	Sprain gastrocnemius	×	✓	×	×
N30z6	Bone infectn.NOS-lower leg	×	✓	×	×	S54y	Knee sprain NOS	×	✓	×	×
N30z7	Bone infectn.NOS-ankle/foot	×	✓	×	×	S54z	Leg sprain NOS	×	✓	×	×
N30z8	Costochondritis NOS	✓	×	×	✓	S55	Sprain ankle/foot	×	✓	×	×
N3100	Paget's disease-cervical spine	✓	×	×	×	S550	Ankle sprain	×	✓	×	×
N3101	Paget's disease-thoracic spine	✓	×	×	×	S5500	Ankle sprain unspecified	×	✓	×	×
N3102	Paget's disease-lumbar spine	✓	×	×	×	S5501	Sprain, ankle joint, medial	×	✓	×	×
N3103	Paget's disease-sacrum	✓	×	×	×	S5502	Sprain ankle joint lateral	×	✓	×	×
N3104	Paget's disease-coccyx	✓	×	×	×	S5503	Distal tibiofibular sprain	×	✓	×	×
N3105	Paget's disease-clavicle	×	×	✓	×	S5504	Sprntndocalcan(Achilles tndn)	×	✓	×	×
N3106	Paget's disease-scapula	×	×	✓	×	S5505	Part tear,ankle,medial lgmt	×	✓	×	×
N3107	Paget's disease-humerus	×	×	✓	×	S5506	Part tear,ankle,lat lgmt	×	✓	×	×
N3108	Paget's disease-radius	×	×	✓	×	S550z	Ankle sprain NOS	×	✓	×	×
N3109	Paget's disease-ulna	×	×	✓	×	S551	Foot sprain	×	✓	×	×
N310A	Paget's disease-carpal bone	×	×	✓	×	S5510	Foot sprain unspecified	×	✓	×	×

Read Code	Read Term	Axial	Lower Limb	Upper Limb	Clinician Defined
N310B	Paget's disease-metacarpal	×	×	✓	×
N310C	Paget's disease-phal, fing/th	×	×	✓	×
N310D	Paget's disease-pelvis	×	✓	×	×
N310E	Paget's disease-femur	×	✓	×	×
N310F	Paget's disease-patella	×	✓	×	×
N310G	Paget's disease-tibia	×	✓	×	×
N310H	Paget's disease-fibula	×	✓	×	×
N310J	Paget's disease-calcaneum	×	✓	×	×
N310K	Paget's disease-talus	×	✓	×	×
N310L	Paget's disease-oth tars bone	×	✓	×	×
N310M	Paget's disease-metatarsal	×	✓	×	×
N310N	Paget's disease-phalanx of toe	×	✓	×	×
N310P	Paget's disease-skull	×	×	×	×
N320	Vertebral epiphysitis	✓	×	×	×
N3200	Juvenile spine osteochond.unsp	✓	×	×	×
N3201	Scheuermann's disease	✓	×	×	×
N3202	Calve's vertebral osteochondr.	✓	×	×	×
N320z	Juvenile spine osteochondr.NOS	✓	×	×	×
N321	Pelvis juvenile osteochondrop.	×	✓	×	×
N3210	Juv.osteochond.hip/pelvis unsp	×	✓	×	×
N3211	Perthes dis. (femoral head)	×	✓	×	×
N3212	Ischiopubic synchondrosis	×	✓	×	×
N3213	Juvenile osteochond.-acetabul.	×	✓	×	×
N3214	Juven.osteochond.-iliac crest	×	✓	×	×
N3215	Symphysis pubis osteochond.	×	✓	×	×
N3216	Coxa plana	×	✓	×	×
N3217	Pseudocoxalgia	×	✓	×	×
N321z	Juv.osteochond.-hip/pelvis NOS	×	✓	×	×
N322	Non tr.slipped upper fem.epiph	×	✓	×	×
N3220	Non traumatic acute SUFE	×	✓	×	×
N3221	Non traum acute-on-chron SUFE	×	✓	×	×
N3222	Non traumatic chronic SUFE	×	✓	×	×
N323	Juvenile osteochondritis -hand	×	×	✓	×
N3230	Juven.osteochond.arm unspecif.	×	×	✓	×
N3231	Juven.osteochond.hand unspecif	×	×	✓	×
N3232	Panner's dis.(humerus capitul)	×	×	✓	×
N3233	Kienbock's dis.(carpal lunate)	×	×	✓	×
N3234	Humerus head juv. osteochondr.	×	×	✓	×
N3235	Metacarpal head juv. osteoch.	×	×	✓	×
N3236	Burn's dis.(lower ulna)	×	×	✓	×
N3237	Radial head juven. osteochond.	×	×	✓	×
N323z	Juven.osteochond.-arm/hand NOS	×	×	✓	×
N324	Juvenile osteochondrosis - leg	×	✓	×	×
N3240	Juvenile osteochondr.-leg unsp	×	✓	×	×
S5511	Sprain, tarso-metatarsal joint	×	✓	×	×
S5512	Sprn,metatarso-phalangeal jt	×	✓	×	×
S5513	Toe sprain	×	✓	×	×
S5514	Sprain, mid tarsal joint	×	✓	×	×
S5515	Sprain, flexor tendon, foot	×	✓	×	×
S5516	Sprain extensor tendon foot	×	✓	×	×
S551z	Foot sprain NOS	×	✓	×	×
S55z	Ankle and foot sprain NOS	×	✓	×	×
S56	Sprain pelvic ligament	×	✓	×	×
S560	Sprain, lumbosacral ligament	✓	×	×	×
S561	Sacroiliac ligament sprain	✓	×	×	×
S5610	Sprn,ant sacro-iliac lgmt	✓	×	×	×
S5611	Sprn,post sacro-iliac lgmt	✓	×	×	×
S562	Sprain, sacrospinous ligament	✓	×	×	×
S563	Sprain, sacrotuberous ligament	✓	×	×	×
S564	Sprain, iliolumbar ligament	✓	×	×	×
S56y	Other spec sacroiliac sprains	✓	×	×	×
S56z	Sacroiliac sprain NOS	✓	×	×	×
S57	Sprain other parts of back	✓	×	×	×
S570	Neck sprain	✓	×	×	×
S5700	Neck sprain unspecified	✓	×	×	×
S5701	Cervical ant.longit.lig.sprain	✓	×	×	×
S5702	Atlanto-axial joint sprain	✓	×	×	×
S5703	Atlanto-occipital joint sprain	✓	×	×	×
S5704	Whiplash injury	✓	×	×	×
S570z	Neck sprain NOS	✓	×	×	×
S571	Thoracic sprain	✓	×	×	×
S572	Lumbar sprain	✓	×	×	×
S573	Sacrum sprain	✓	×	×	×
S5730	Sacral sprain unspecified	✓	×	×	×
S5731	Sacrococcygeal sprain	✓	×	×	×
S573z	Sacrum sprain NOS	✓	×	×	×
S574	Coccyx sprain	✓	×	×	×
S57z	Back sprain NOS	✓	×	×	×
S57z0	Pulled back muscle	✓	×	×	×
S58	Complete tear, shoulder joint	×	×	✓	×
S580	Cmplt tr,acromio-clav lgmt	×	×	✓	×
S581	Cmplt tr,coraco-clav lgmt	×	×	✓	×
S58z	Complete tear,shoulder jt NOS	×	×	✓	×
S59	Complete tear, elbow joint	×	×	✓	×
S590	Cmplt tr,elbw jt,lat coll lgmt	×	×	✓	×
S591	Cmplt tr,elbw jt,mdl coll lgmt	×	×	✓	×
S59z	Complete tear, elbow joint NOS	×	×	✓	×
S5A	Complete tear, wrist or hand	×	×	✓	×

Read Code	Read Term	Axial	Lower Limb	Upper Limb	Clinician Defined	Read Code	Read Term	Axial	Lower Limb	Upper Limb	Clinician Defined
N3241	Kohler's dis.(prim.patell.ctr)	×	✓	×	×	S5A0	Complete tear wrist ligament	×	×	✓	×
N3242	Blount's dis.(proximal tibia)	×	✓	×	×	S5A00	Cmplt tr radial collat lgmt	×	×	✓	×
N3243	Sinding-Larsen's dis.(patella)	×	✓	×	×	S5A01	Cmp tr prox radcarp lgm non-sp	×	×	✓	×
N3244	Osgood-Schlatters dis.(tibia)	×	✓	×	×	S5A02	Cmp tr vlr rad-crp lgmt non-sp	×	×	✓	×
N324z	Juvenile osteochondr.-leg,NOS	×	✓	×	×	S5A03	Cmp tr vlr rad-crp lgm superfc	×	×	✓	×
N325	Juvenile osteochondrosis-foot	×	✓	×	×	S5A04	Cmp tr rad-scpho-capitate lgmt	×	×	✓	×
N3250	Juvenile osteochond.-foot unsp	×	✓	×	×	S5A05	Cmplt tr rad-lunate lgmt	×	×	✓	×
N3251	Diaz's disease (astragalus)	×	✓	×	×	S5A06	Cmplt tr rad-scpho-lunate lgmt	×	×	✓	×
N3252	Sever's disease (calcaneum)	×	✓	×	×	S5A07	Cmplt tr dorsal rad-carp lgmt	×	×	✓	×
N3253	Freiberg's dis.(second metat.)	×	✓	×	×	S5A08	Cmpl tr uln carp cmplx non-sp	×	×	✓	×
N3254	Iselin's dis.(fifth metatars.)	×	✓	×	×	S5A09	Cmplt tr uln-carp meniscus	×	×	✓	×
N3255	Haglund's dis.(os tibiale ext)	×	✓	×	×	S5A0A	Cmplt tr triang fibrocartilage	×	×	✓	×
N3256	Kohler's dis.(tarsal navicul.)	×	✓	×	×	S5A0B	Cmplt tr ulno-lunate lgmt	×	×	✓	×
N325z	Juvenile osteochond.-foot NOS	×	✓	×	×	S5A0C	Cmplt tr uln collat lgmt	×	×	✓	×
N3270	Osteochondritis dissec-patella	×	✓	×	×	S5A0D	Comp tr shrt intr lig non-sp	×	×	✓	×
N3271	Osteochondr diss-lat fem cond	×	✓	×	×	S5A0E	Cmplt tr scapho-trapezium lgmt	×	×	✓	×
N3272	Other osteochondr dissec-knee	×	✓	×	×	S5A0F	Cmplt tr luno-triquetral lgmt	×	×	✓	×
N3273	Osteochondr dissec-hum head	×	×	✓	×	S5A0G	Cmplt tr scapho-lunate lgmt	×	×	✓	×
N3274	Osteochondr dissec-capitellum	×	✓	×	×	S5A0H	Cmpl tr volar intercarp/V lgmt	×	×	✓	×
N3275	Osteochondr dissec-radial head	×	×	✓	×	S5A0J	Cmplt tr dorsal intercarp lgmt	×	×	✓	×
N3276	Other osteochondr diss-elbow	×	×	✓	×	S5A0z	Cmplt tr wrist lgmt NOS	×	×	✓	×
N3277	Osteochondritis dissec-wrist	×	×	✓	×	S5A1	Complete tear ligament thumb	×	×	✓	×
N3278	Osteochondr dissec-fem head	×	✓	×	×	S5A10	Cmp tr thmb MCPJ radl coll lgm	×	×	✓	×
N3279	Osteochondritis dissec-talus	×	✓	×	×	S5A11	Cmp tr thmb MCPJ uln coll lgmt	×	×	✓	×
N327y	Osteochondr dissec-other site	×	×	×	×	S5A12	Cmp tr thmb IPJ rad coll lgmt	×	×	✓	×
N328	Juv osteochondrosis of spine	✓	×	×	×	S5A13	Cmp tr thmb IPJ uln coll lgmt	×	×	✓	×
N32y	Slipped radial epiphysis	×	×	✓	×	S5A1z	Cmplt tr lgmt thumb NOS	×	×	✓	×
N32y0	Adult osteochondrosis of spine	✓	×	×	×	S5A2	Complete tear ligament finger	×	×	✓	×
N32y1	Kienbock's disease of adults	×	×	✓	×	S5A20	Cmp tr fngr MCPJ radl coll lgm	×	×	✓	×
N32yz	Other spec.osteochondrop.NOS	×	×	×	×	S5A21	Cmp tr fngr MCPJ uln coll lgmt	×	×	✓	×
N32z2	Osteochondritis of knee	×	✓	×	×	S5A22	Cmp tr fngr PIPJ rdl coll lgmt	×	×	✓	×
N3308	Local osteoporosis - Lequesne	×	×	×	×	S5A23	Cmp tr fngr PIPJ uln coll lgmt	×	×	✓	×
N330B	Vertebral osteoporosis	✓	×	×	×	S5A24	Cmpt tr fngr DIPJ rdl coll lgm	×	×	✓	×
N330C	Osteoporosis localized spine	✓	×	×	×	S5A25	Cmp tr fngr DIPJ uln coll lgmt	×	×	✓	×
N331	Collapse of vertebra NOS	✓	×	×	×	S5A2z	Cmplt tr lgmt finger NOS	×	×	✓	×
N3310	Collapse of thoracic vertebra	✓	×	×	×	S5Az	Complete tear wrist/hand NOS	×	×	✓	×
N3311	Pathological # - lumbar vert.	✓	×	×	×	S5B	Complete tear, hip ligament	×	✓	×	×
N3312	Postoophorc osteopor+path frct	×	×	×	×	S5B0	Cmplt tr Iliofemoral lgmt	×	✓	×	×
N3313	Osteopor of disuse + path frct	×	×	×	×	S5By	Cmplt tr other hip lgmt	×	✓	×	×
N3314	Postsur malab osteop+path frct	×	×	×	×	S5Bz	Complete tear hip ligament NOS	×	✓	×	×
N3315	Drug-ind osteopor + path fract	×	×	×	×	S5C	Complete tear, knee ligament	×	✓	×	×
N3316	Idiopath osteopor + path fract	×	×	×	×	S5C0	Cmplt tr,knee,lat collat lgmt	×	✓	×	×
N3317	Fract of bone in neoplast dis	×	×	×	×	S5C1	Cmplt tr,knee,mdl collat lgmt	×	✓	×	×
N3318	Osteopor path # lumb vertebrae	✓	×	×	×	S5C2	Cmp tr,knee,post cruciate lgmt	×	✓	×	×

Read Code	Read Term	Axial	Lower Limb	Upper Limb	Clinician Defined	Read Code	Read Term	Axial	Lower Limb	Upper Limb	Clinician Defined
N3319	Osteopor path # thor vertebrae	✓	×	×	×	S5C3	Cmpl tr,knee,ant cruciate lgmt	×	✓	×	×
N331A	Osteopor path # cerv vertebrae	✓	×	×	×	S5Cy	Cmplt tr,other knee lgmt	×	✓	×	×
N331B	Postmenop osteopor+path fract	×	×	×	×	S5Cz	Cmplt tr,knee lgmt NOS	×	✓	×	×
N331C	Pathological # cervical vert	✓	×	×	×	S5D	Cmplt tr,ankle/foot lgmt	×	✓	×	×
N331D	Collapsed vertebra NOS	✓	×	×	×	S5D0	Complete tear, ankle ligament	×	✓	×	×
N331E	Collapse of cervical vertebra	✓	×	×	×	S5D00	Cmplt tr,ankle,mdl lgmt	×	✓	×	×
N331F	Collapse of thoracic vertebra	✓	×	×	×	S5D01	Cmplt tr,ankle,lat lgmt	×	✓	×	×
N331G	Collapse of lumbar vertebra	✓	×	×	×	S5D0z	Cmplt tr,ankle lgmt NOS	×	✓	×	×
N331H	Collap cerv vert due to osteop	✓	×	×	×	S5D1	Complete tear, foot ligament	×	✓	×	×
N331J	Collap lumb vert due to osteo	✓	×	×	×	S5D10	Cmplt tr,mid tarsal jt lgmt	×	✓	×	×
N331K	Coll thorac vert due osteopor	✓	×	×	×	S5D11	Cmplt tr,tarsometatarsal lgmt	×	✓	×	×
N331L	Collap vert due osteopor NOS	✓	×	×	×	S5D12	Cmplt tr,metatarsophalan lgmt	×	✓	×	×
N331M	Fragility # unsp osteoporosis	×	×	×	×	S5D13	Cmplt tr,interphalan(toe)lgmt	×	✓	×	×
N331y	Pathological fracture OS	×	×	×	×	S5D1z	Cmplt tr,foot lgmt NOS	×	✓	×	×
N331z	Pathological fracture NOS	×	×	×	×	S5Dz	Cmplt tr,ankle/foot lgmt NOS	×	✓	×	×
N332	Cyst of bone	×	×	×	×	S5E	Cmplt tr,other lgmt,exc pelvis	×	✓	×	×
N3320	Bone cyst (localised),unspecif	×	×	×	×	S5E0	Complete tear, jaw ligament	×	×	×	×
N3321	Solitary bone cyst	×	×	×	×	S5E1	Cmplt tr,thyroid region lgmt	✓	×	×	×
N3322	Aneurysmal bone cyst	×	×	×	×	S5E2	Complete tear, rib ligament	✓	×	×	×
N3323	Monostotic fibrous dysplasia	×	×	×	×	S5E20	Cmplt tr,chondrocostal jt lgmt	✓	×	×	×
N3324	Fibrous cortical defect	×	×	×	×	S5E21	Cmplt tr,costal cartilage lgmt	✓	×	×	×
N332z	Cyst of bone NOS	×	×	×	×	S5E2z	Cmplt tr,rib lgmt NOS	✓	×	×	×
N333	Hyperostosis of skull	×	×	×	×	S5E3	Cmplt tr,sternum lgmt	✓	×	×	×
N3330	Hyperostosis interna frontalis	×	×	×	×	S5E30	Cmplt tr,sternoclavicular lgmt	×	×	✓	×
N3331	Leontiasis ossium	×	×	×	×	S5E31	Cmplt tr,chondrosternal lgmt	✓	×	×	×
N333z	Hyperostosis of skull NOS	×	×	×	×	S5E32	Cmpl tr,xiphoid cartilage lgmt	✓	×	×	×
N334	Avascular necrosis - bone	×	×	×	×	S5E3z	Cmplt tr,sternum lgmt NOS	✓	×	×	×
N3340	Avasc.bone necrosis site unsp.	×	×	×	×	S5Ez	Cmplt tr,other lgmt NOS	×	×	×	×
N3341	Avasc.necrosis-head of humerus	×	×	✓	×	S5F	Open division shoulder lgmt	×	×	✓	×
N3342	Avascular necrosis head-femur	×	✓	×	×	S5F0	Opn dvsn acromioclavic lgmt	×	×	✓	×
N3343	Femoral cond. avasc.necrosis	×	✓	×	×	S5F1	Opn dvsn coracoclavicular lgmt	×	×	✓	×
N3344	Avascular necrosis-talus	×	✓	×	×	S5Fz	Open dvsn shoulder lgmt NOS	×	×	✓	×
N3345	Avascular necrosis, capitellum	×	✓	×	×	S5G	Open division elbow ligament	×	×	✓	×
N3346	Avasc necrosis, lat fem cond	×	✓	×	×	S5G0	Opn dvsn elbow,lat collat lgmt	×	×	✓	×
N3347	Avascular necrosis-other bone	×	×	×	×	S5G1	Opn dvsn elbow,mdl collat lgmt	×	×	✓	×
N3348	Idiopath asep necrosis of bone	×	×	×	×	S5G2	Opn division radhumeral lgmt	×	×	✓	×
N334A	Osteonecr due to prev trauma	×	×	×	×	S5G3	Open dvsn ulnohumeral lgmt	×	×	✓	×
N334B	Osteonecrosis in caisson dis	×	×	×	×	S5Gy	Open dvsn other elbow lgmt	×	×	✓	×
N334C	Osteonecr due haemoglobinopath	×	×	×	×	S5Gz	Open division elbow lgmt NOS	×	×	✓	×
N335	Osteitis condensans	✓	×	×	×	S5H	Open division wrist/hand lgmt	×	×	✓	×
N3350	Osteitis condensans ilii	✓	×	×	×	S5H0	Open division wrist ligament	×	×	✓	×
N336	Tietze's disease	✓	×	×	✓	S5H00	Open dvsn wrist lgmt,single	×	×	✓	×
N3372	Algodystrophy of hand	×	×	✓	×	S5H01	Open dvsn wrist lgmts,multiple	×	×	✓	×
N3373	Algodystrophy of knee	×	✓	×	×	S5H0z	Open division wrist lgmt NOS	×	×	✓	×

Read Code	Read Term	Axial	Lower Limb	Upper Limb	Clinician Defined
N3374	Algodystrophy of foot	×	✓	×	×
N338	Malunion/nonunion of fracture	×	×	×	×
N3380	Malunion of fracture	×	×	×	×
N3381	Pseudoarthrosis-fract.nonunion	×	×	×	×
N3382	Hypertrophic non-union of #	×	×	×	×
N3383	Atrophic non-union of fracture	×	×	×	×
N3384	Angular mal-union of fracture	×	×	×	×
N3385	Rotational mal-union of #	×	×	×	×
N3386	Delayed union of fracture	×	×	×	×
N338z	Fracture malunion/nonunion NOS	×	×	×	×
N339	Residual foreign body in bone	×	×	×	×
N33A0	Bony pelvic pain	×	✓	×	✓
N33A1	Clavicle pain	×	×	✓	✓
N33z2	Chondromalacia NOS	×	×	×	×
N33zE	Costochondritis	✓	×	×	✓
N33zz	Costochondritis NOS	✓	×	×	✓
N34	Fallen arches	×	✓	×	✓
N340	Pes planus - acquired	×	✓	×	✓
N3400	Hypermobile flat foot	×	✓	×	✓
N3401	Rigid flat foot	×	✓	×	✓
N3402	Peroneal spastic flat foot	×	✓	×	×
N341	Talipes planus - acquired	×	✓	×	✓
N34z	Flat foot NOS	×	✓	×	✓
N35	Acquired deformities of toe	×	✓	×	×
N350	Hallux valgus - acquired	×	✓	×	×
N351	Hallux varus - acquired	×	✓	×	×
N352	Hallux rigidus - acquired	×	✓	×	×
N353	Hallux malleus	×	✓	×	×
N354	Other hammer toe - acquired	×	✓	×	×
N355	Claw toe - acquired	×	✓	×	×
N356	Clawing of great toe	×	✓	×	×
N357	Crossover toe	×	✓	×	×
N358	Mallet toe	×	✓	×	×
N359	Bunionette	×	✓	×	×
N35A	Over-riding 5th toe	×	✓	×	×
N35y	Other acquired toe deformity	×	✓	×	×
N35z	Acquired toe deformity NOS	×	✓	×	×
N36	Other acquired limb deformity	×	×	×	×
N360	Acquir.forearm def.ex.fingers	×	×	✓	×
N3600	Acquired forearm deform.unspec	×	×	✓	×
N3601	Cubitus valgus - acquired	×	×	✓	×
N3602	Cubitus varus - acquired	×	×	✓	×
N3603	Acquired valgus wrist deform.	×	×	✓	×
N3604	Acquired varus wrist deformity	×	×	✓	×
S5H1	Open division thumb ligament	×	×	✓	×
S5H10	Opn dvs thmb MCPJ,rdl coll lgm	×	×	✓	×
S5H11	Opn dvs thmb MCPJ,uln coll lgm	×	×	✓	×
S5H12	Opn dvs thmb IPJ,rdl coll lgmt	×	×	✓	×
S5H13	Opn dvs thmb IPJ,uln coll lgmt	×	×	✓	×
S5H1z	Open division thumb lgmt NOS	×	×	✓	×
S5H2	Open division finger ligament	×	×	✓	×
S5H20	Opn dvs fngr MCPJ,rdl coll lgm	×	×	✓	×
S5H21	Opn dvs fngr MCPJ,uln coll lgm	×	×	✓	×
S5H22	Opn dvs fngr PIPJ,rdl coll lgm	×	×	✓	×
S5H23	Opn dvs fngr PIPJ,uln coll lgm	×	×	✓	×
S5H24	Opn dvs fngr DIPJ,rdl coll lgm	×	×	✓	×
S5H25	Opn dvs fngr DIPJ,uln coll lgm	×	×	✓	×
S5H2z	Open division fngr lgmt NOS	×	×	✓	×
S5Hz	Open dvsn wrist/hand lig NOS	×	×	✓	×
S5J	Open division hip ligament	×	✓	×	×
S5J0	Open division iliofemoral lgmt	×	✓	×	×
S5Jy	Other spec opn dvsn hip lgmt	×	✓	×	×
S5Jz	Open division hip ligament NOS	×	✓	×	×
S5K	Open division ligament knee	×	✓	×	×
S5K0	Opn dvsn lat collat lgmt knee	×	✓	×	×
S5K1	Opn dvsn mdl collat lgmt knee	×	✓	×	×
S5K2	Opn dvs post cruciate lgm knee	×	✓	×	×
S5K3	Opn dvs ant cruciate lgmt knee	×	✓	×	×
S5K4	Opn dvsn,sup tibiofibular lgmt	×	✓	×	×
S5Ky	Open division other knee lgmt	×	✓	×	×
S5Kz	Open division knee lgmt NOS	×	✓	×	×
S5L	Open division lgmt ankle/foot	×	✓	×	×
S5L0	Open division ankle ligament	×	✓	×	×
S5L00	Open division ankle,mdl lgmt	×	✓	×	×
S5L01	Open division ankle,lat lgmt	×	✓	×	×
S5L02	Open dvsn calcaneofibular lgmt	×	✓	×	×
S5L03	Opn dvs dstl tibiofibular lgmt	×	✓	×	×
S5L0z	Open division ankle lgmt NOS	×	✓	×	×
S5L1	Open division foot ligament	×	✓	×	×
S5L10	Open dvsn,mid tarsal jt lgmt	×	✓	×	×
S5L11	Open dvsn tarsometatarsal lgmt	×	✓	×	×
S5L12	Open dvsn metatarsophalan lgmt	×	✓	×	×
S5L13	Open dvsn interphalan(toe)lgmt	×	✓	×	×
S5L1z	Open division foot lgmt NOS	×	✓	×	×
S5Lz	Open dvsn ankle/foot lgmt NOS	×	✓	×	×
S5M	Open division pelvic ligament	×	✓	×	×
S5M0	Open division symphysis pubis	×	✓	×	×
S5M1	Open dvsn sacrotuberous lgmt	✓	×	×	×

Read Code	Read Term	Axial	Lower Limb	Upper Limb	Clinician Defined
N3605	Wrist drop - acquired	×	×	✓	×
N3606	Claw hand - acquired	×	×	✓	×
N3607	Club hand - acquired	×	×	✓	×
N360z	Acquired forearm deformity NOS	×	×	✓	×
N361	Mallet finger	×	×	✓	×
N362	Other acquired finger deform.	×	×	✓	×
N3620	Acquired finger deformity unsp	×	×	✓	×
N3621	Boutonniere finger deformity	×	×	✓	×
N3622	Swan-neck finger deformity	×	×	✓	×
N3623	Flexion deformity of finger	×	×	✓	×
N3624	Extension deformity of finger	×	×	✓	×
N3625	Deviation of finger	×	×	✓	×
N3626	Rotational deformity of finger	×	×	✓	×
N362z	Acquired finger deformity NOS	×	×	✓	×
N363	Acquired deformities of hip	×	✓	×	×
N3630	Acquired hip deformity unspec.	×	✓	×	×
N3631	Coxa valga - acquired	×	✓	×	×
N3632	Coxa vara - acquired	×	✓	×	×
N3633	Acq internal femoral torsion	×	✓	×	×
N3634	Persistent femoral anteversion	×	✓	×	×
N3635	Acq external femoral torsion	×	✓	×	×
N363z	Acquired hip deformity NOS	×	✓	×	×
N364	Acquired genu valgum/varum	×	✓	×	×
N3640	Knock knee	×	✓	×	×
N3641	Bow legged	×	✓	×	×
N364z	Acquired genu valgum/varum NOS	×	✓	×	×
N365	Genu recurvatum - acquired	×	✓	×	×
N366	Acquired knee deformity NOS	×	✓	×	×
N3660	Flexion deformity of knee	×	✓	×	×
N367	Other acquir.ankle/foot deform	×	✓	×	×
N3670	Acquir.ankle/foot deform.unsp.	×	✓	×	×
N3671	Acquired equinovarus-clubfoot	×	✓	×	×
N3672	Acquired equinus foot deform.	×	✓	×	×
N3673	Aquired cavus foot deformity	×	✓	×	×
N3674	Acquired claw foot	×	✓	×	×
N3675	Acquired cavovarus foot deform	×	✓	×	×
N3676	Other acquir.calcaneus deform.	×	✓	×	×
N3677	Acquired talipes NEC	×	✓	×	×
N3678	Acquired varus heel	×	✓	×	×
N3679	Acquired valgus heel	×	✓	×	×
N367A	Plantar flexion-midtarsal jnt	×	✓	×	×
N367B	Plantar flex contracture-TMTJ	×	✓	×	×
N367C	Flexion contracture-MTPJ	×	✓	×	×
N367D	Extension contracture-MTPJ	×	✓	×	×
S5M2	Open dvsn sacrospinous lgmt	✓	×	×	×
S5M3	Open division sacroiliac lgmt	✓	×	×	×
S5M30	Open dvsn ant sacro-iliac lgmt	✓	×	×	×
S5M31	Opn dvsn post sacro-iliac lgmt	✓	×	×	×
S5M3z	Open dvsn sacroiliac lgmt NOS	✓	×	×	×
S5M4	Open division iliolumbar lgmt	✓	×	×	×
S5M5	Open division lumbosacral lgmt	✓	×	×	×
S5My	Othr spec opn dvsn pelvic lgmt	×	✓	×	×
S5Mz	Open division pelvic lgmt NOS	×	✓	×	×
S5N	Opn dvsn,lgmt other part back	✓	×	×	×
S5N0	Open dvsn, neck ligament	✓	×	×	×
S5N1	Open division,thoracic lgmt	✓	×	×	×
S5N2	Open division, lumbar ligament	✓	×	×	×
S5N3	Open division, sacrum ligament	✓	×	×	×
S5Nz	Open divisn, back ligament NOS	✓	×	×	×
S5P	Open division, other ligament	×	×	×	×
S5P0	Open division, jaw ligament	×	×	×	×
S5P00	Opn dvsn,temporomandibulr lgmt	×	×	×	×
S5P0z	Opn dvsn,jaw ligament NOS	×	×	×	×
S5P1	Opn dvsn,thyroid region lgmt	✓	×	×	×
S5P10	Opn dvsn,cricoarytenoid lgmt	✓	×	×	×
S5P11	Opn dvsn,cricothyroid ligament	✓	×	×	×
S5P12	Opn dvsn,thyroid cartilge lgmt	✓	×	×	×
S5P1z	Opn dvsn,thyroid regn lgmt NOS	✓	×	×	×
S5P2	Open division, rib ligament	✓	×	×	×
S5P20	Opn dvsn,chondrocost jnt lgmt	✓	×	×	×
S5P21	Opn dvsn,costal cartilage lgmt	✓	×	×	×
S5P2z	Opn dvsn,rib ligament NOS	✓	×	×	×
S5P3	Opn dvsn,sternal ligament	✓	×	×	×
S5P30	Opn dvsn,sternoclavicular lgmt	×	×	✓	×
S5P31	Opn dvsn,chondrosternal lgmt	✓	×	×	×
S5P32	Opn dvsn,xiphoid cartilge lgmt	✓	×	×	×
S5P3z	Opn dvsn,sternal ligament NOS	✓	×	×	×
S5Pz	Open division, other lig NOS	×	×	×	×
S5Q	Rupture tendon upper arm	×	×	✓	×
S5Q0	Rupture infraspinatus tendon	×	×	✓	×
S5Q1	Rupture subscapularis tendon	×	×	✓	×
S5Q2	Rupture supraspinatus tendon	×	×	✓	×
S5Q3	Rupture long head biceps tendn	×	×	✓	×
S5Q4	Rupture biceps tendon	×	×	✓	×
S5Q5	Rupture triceps tendon	×	×	✓	×
S5Q6	Inj tendon rotator cuff should	×	×	✓	×
S5Qz	Rupture tendon upper arm NOS	×	×	✓	×
S5R	Rupture tendon forearm/wrist	×	×	✓	×

Read Code	Read Term	Axial	Lower Limb	Upper Limb	Clinician Defined	Read Code	Read Term	Axial	Lower Limb	Upper Limb	Clinician Defined
N367E	Flexion contracture-toe joint	×	✓	×	×	S5R0	Rupture wrist extensors	×	×	✓	×
N367F	Acq plantar-flexed forefoot	×	✓	×	×	S5R1	Rupture wrist flexors	×	×	✓	×
N367G	Acq plantar-flexed first ray	×	✓	×	×	S5Rz	Rupture tendon hand/wrist NOS	×	×	✓	×
N367H	Acq plantar-flexed fifth ray	×	✓	×	×	S5S	Rupture tendon of thumb	×	×	✓	×
N367J	Acquired dorsiflexed forefoot	×	✓	×	×	S5S0	Rupture flexor pollicis longus	×	×	✓	×
N367K	Acquired dorsiflexed first ray	×	✓	×	×	S5S1	Rupture extnsr pollicis longus	×	×	✓	×
N367L	Acquired supinated forefoot	×	✓	×	×	S5S2	Mallet thumb+clsd tndn injury	×	×	✓	×
N367M	Acquired pronated forefoot	×	✓	×	×	S5Sz	Rupture tendon thumb NOS	×	×	✓	×
N367N	Acquired forefoot adductus	×	✓	×	×	S5T	Rupture tendon of finger	×	×	✓	×
N367P	Acquired forefoot abductus	×	✓	×	×	S5T0	Rupt flexr digit superfic tndn	×	×	✓	×
N367Q	Serpentine foot	×	✓	×	×	S5T1	Rupt flex digit profundus tndn	×	×	✓	×
N367z	Acquired ankle/foot deform.NOS	×	✓	×	×	S5T2	Rupt extensor digit tndn	×	×	✓	×
N368	Other knee deformity	×	✓	×	×	S5T3	Mallet finger+cls tndn injury	×	×	✓	×
N3680	Acq internal tibial torsion	×	✓	×	×	S5Tz	Rupture tendon of finger NOS	×	×	✓	×
N3681	Acq external tibial torsion	×	✓	×	×	S5U	Rupture tendon thigh	×	✓	×	×
N3682	Chronic instability of knee	×	✓	×	×	S5U0	Rupture quadriceps tendon	×	✓	×	×
N36A	Drop foot	×	✓	×	×	S5U1	Rupture hamstring tendon	×	✓	×	×
N36y	Torsion tibia	×	✓	×	×	S5U2	Rupture patellar tendon	×	✓	×	×
N36y0	Acquired unequal leg length	×	✓	×	×	S5Uz	Rupture upper leg tendon NOS	×	✓	×	×
N36y1	Acquired unequal arm length	×	×	✓	×	S5V	Rupture tendon leg or foot	×	✓	×	×
N36y3	Deformity of clavicle	×	×	✓	×	S5V0	Rupture achilles tendon	×	✓	×	×
N36y4	Deformity of scapula	×	×	✓	×	S5V1	Rupture plantaris tendon	×	✓	×	×
N36y5	Deformity of humerus	×	×	✓	×	S5V2	Rupture foot flexor tendon	×	✓	×	×
N36y6	Deformity of radius	×	×	✓	×	S5V3	Rupture foot extensor tendon	×	✓	×	×
N36y7	Deformity of ulna	×	×	✓	×	S5Vz	Rupture tendon leg/foot NOS	×	✓	×	×
N36y8	Deformity of carpal bone	×	×	✓	×	S5W	Other specified tendon rupture	×	×	×	×
N36y9	Deformity of metacarpal	×	×	✓	×	S5y0	Septal cartilage nose sprain	×	×	×	×
N36yA	Deformity of phalanx - fing/th	×	×	✓	×	S5y1	Jaw sprain	×	×	×	×
N36yB	Deformity of pelvis	×	✓	×	×	S5y10	Jaw sprain, unspecified	×	×	×	×
N36yC	Deformity of femur	×	✓	×	×	S5y11	Temporomandibular sprain	×	×	×	×
N36yD	Deformity of patella	×	✓	×	×	S5y1z	Jaw sprain NOS	×	×	×	×
N36yE	Deformity of tibia	×	✓	×	×	S5y3	Rib sprain	✓	×	×	×
N36yF	Deformity of fibula	×	✓	×	×	S5y30	Rib sprain unspecified	✓	×	×	×
N36yG	Deformity of calcaneum	×	✓	×	×	S5y31	Chondrocostal joint sprain	✓	×	×	×
N36yH	Deformity of talus	×	✓	×	×	S5y32	Costal cartilage sprain	✓	×	×	×
N36yJ	Deformity of other tarsal bone	×	✓	×	×	S5y3z	Rib sprain NOS	✓	×	×	×
N36yK	Deformity of metatarsal	×	✓	×	×	S5y4	Sternum sprain	✓	×	×	×
N36yL	Deformity of phalanx of toe	×	✓	×	×	S5y40	Sternum sprain unspecified	✓	×	×	×
N36yM	Old amputee NOS	×	×	×	×	S5y41	Sternoclavicular sprain	×	×	✓	×
N36yz	Acquired limb deformity NEC	×	×	×	×	S5y42	Chondrosternal sprain	✓	×	×	×
N36z	Drop foot	×	✓	×	×	S5y43	Xiphoid cartilage sprain	✓	×	×	×
N37	Curvature of spine	✓	×	×	×	S5y4z	Sternum sprain NOS	✓	×	×	×
N370	Adolescent postural kyphosis	✓	×	×	×	S5y5	Pelvis sprain or complete tear	×	✓	×	×
N371	Acquired kyphosis	✓	×	×	×	S5y50	Sprain of pelvis, unspecified	×	✓	×	×

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N3710	Acquired postural kyphosis	✓	×	×	×	S5y51	Sprain symphysis pubis	×	✓	×	×
N3711	Radiation kyphosis	✓	×	×	×	S5y52	Cmpl tear,symphysis pubis lgmt	×	✓	×	×
N3712	Post-laminectomy kyphosis	✓	×	×	×	S5y53	Cmpl tear,sacrotuberous lgmt	✓	×	×	×
N3713	Kyphosis due to oth treatment	✓	×	×	×	S5y54	Cmpl tear,sacrospinous lgmt	✓	×	×	×
N371z	Acquired kyphosis NOS	✓	×	×	×	S5y55	Cmpl tear,sacroiliac lgmt	✓	×	×	×
N372	Acquired lordosis	✓	×	×	×	S5y56	Cmpl tear,iliolumbar lgmt	✓	×	×	×
N3720	Acquired postural lordosis	✓	×	×	×	S5y57	Cmpl tear,lumbosacral lgmt	✓	×	×	×
N3721	Post-laminectomy lordosis	✓	×	×	×	S5y5z	Sprain of pelvis NOS	×	✓	×	×
N3722	Other post-surgical lordosis	✓	×	×	×	S5yX	Spr/str oth/unsp parts thor	✓	×	×	×
N372z	Acquired lordosis NOS	✓	×	×	×	S5z	Ligament sprain NOS	×	×	×	×
N373	Kyphoscoliosis and scoliosis	✓	×	×	×	S6	Intracranial inj.excl.+skull #	×	×	×	×
N3730	Idiopathic scoliosis	✓	×	×	×	S64	Head injury	×	×	×	×
N3731	Idiopathic kyphoscoliosis	✓	×	×	×	S6401	Minor head injury	×	×	×	×
N3732	Resolving infant.idiopath.scol	✓	×	×	×	S646	Head injury	×	×	×	×
N3733	Progressive infant.idiop.scol.	✓	×	×	×	S6460	Minor head injury	×	×	×	×
N3734	Radiation scoliosis	✓	×	×	×	S7	Injury To Chest	✓	×	×	×
N3735	Thoracogenic scoliosis	✓	×	×	×	S72x	Crushedchest	✓	×	×	×
N3736	Postural scoliosis	✓	×	×	×	S77	Injury To Chest	✓	×	×	×
N3737	Adolescent idiopath scoliosis	✓	×	×	×	S797	InjuryToChest	✓	×	×	×
N3738	Post-surgical scoliosis	✓	×	×	×	S8*	Laceration of head/neck/trunk	×	×	×	×
N3739	Scoliosis due to oth treatment	✓	×	×	×	S83	Other open wound of head	×	×	×	×
N373z	Kyphoscoliosis or scoliosis NOS	✓	×	×	×	S830	Open wound of scalp	×	×	×	×
N374	Spine curvature+other condits.	✓	×	×	×	S831	Open wound scalp+complication	×	×	×	×
N3740	Curvature of spine unspecified	✓	×	×	×	S8343	Open wound of eyebrow	×	×	×	×
N3741	Kyphosis + other condition	✓	×	×	×	S84	Open wound of neck	✓	×	×	×
N3742	Lordosis + other condition	✓	×	×	×	S852	Open wound of front wall of thorax	✓	×	×	×
N3743	Scoliosis + other condition	✓	×	×	×	S8z	Laceration	×	×	×	×
N3744	Kyphosis in skeletal dysplasia	✓	×	×	×	S9	Laceration of arm	×	×	✓	×
N3745	Neuromuscular kyphosis	✓	×	×	×	S90	Open wound shoulder/upper limb	×	×	✓	×
N3746	Osteoporotic kyphosis	✓	×	×	×	S9000	Open wound of shoulder region	×	×	✓	×
N3747	Lordosis in skeletal dysplasia	✓	×	×	×	S900z	Opn wound shoulder+up limb,NOS	×	×	✓	×
N3748	Lordosis in hip disease	✓	×	×	×	S9010	Open wound shoulder+complicat.	×	×	✓	×
N3749	Neuromuscular lordosis	✓	×	×	×	S902	Tendon inj + open wound arm	×	×	✓	×
N374A	Scoliosis in skelet dysplasia	✓	×	×	×	S9020	Open wound shoulder+tendon inv	×	×	✓	×
N374B	Neuromuscular scoliosis	✓	×	×	×	S9021	Open wound scapular+tendon inv	×	×	✓	×
N374C	Scoliosis in neurofibromatosis	✓	×	×	×	S9022	Open wound axillary+tendon inv	×	×	✓	×
N374D	Scoliosis in conn tiss anomal	✓	×	×	×	S9023	Open wound upper arm+tendon	×	×	✓	×
N374E	Flatback syndrome	✓	×	×	×	S9025	Complete dvsn,biceps tendon	×	×	✓	×
N374W	Lordosis, unspecified	✓	×	×	×	S9026	Complete dvsn,triceps tendon	×	×	✓	×
N374X	Other+unspecified kyphosis	✓	×	×	×	S9028	Partial division biceps tendon	×	×	✓	×
N374z	Spine curvature+other cond.NOS	✓	×	×	×	S9029	Partial dvsn,triceps tendon	×	×	✓	×
N37y	Other curvatures of spine	✓	×	×	×	S902x	Mult.opn.wnd.upper arm+tendon	×	×	✓	×
N37z	Curvature of spine NOS	✓	×	×	×	S902z	Opn.wound upper arm+tendon NOS	×	×	✓	×
N37z0	Acquired hunchback	✓	×	×	×	S9030	Degloving injury,shoulder area	×	×	✓	×

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N37zz	Curvature of spine NOS	✓	×	×	×	S906	Traumat amp at shoulder joint	×	×	✓	×
N380	Acquired deformity of nose	×	×	×	×	S91	Open Wound - Wrist	×	×	✓	×
N381	Other acquired head deformity	×	×	×	×	S9100	Open wound of forearm	×	×	✓	×
N382	Acquired deformity of neck	✓	×	×	×	S9101	Open wound of elbow	×	×	✓	×
N383	Acquired chest/rib deformity	✓	×	×	×	S9102	Open wound wrist unspecified	×	×	✓	×
N3830	Acquired chest deformity unsp.	✓	×	×	×	S9103	Open wound of wrist, volar	×	×	✓	×
N3831	Acquired rib deformity unsp.	✓	×	×	×	S9104	Open wound of wrist, dorsal	×	×	✓	×
N3832	Acquired pectus carinatum	✓	×	×	×	S911	Open wound lower arm+complic.	×	×	✓	×
N3833	Acquired pectus excavatum	✓	×	×	×	S9111	Open wound elbow+complication	×	×	✓	×
N383z	Acquired chest/rib deform.NOS	✓	×	×	×	S9112	Open wound wrist+complication	×	×	✓	×
N384	Acquired spondylolisthesis	✓	×	×	×	S912	Open wound lowr arm+tendon inj	×	×	✓	×
N3840	Dysplastic spondylolisthesis	✓	×	×	×	S9120	Open wound forearm+tendon inv.	×	×	✓	×
N3841	Isthmic spondylolisthesis	✓	×	×	×	S9121	Open wound elbow+tendon inv.	×	×	✓	×
N3842	Degenerative spondylolisthesis	✓	×	×	×	S9122	Open wound wrist+tendon inv.	×	×	✓	×
N3843	Pedicular spondylolisthesis	✓	×	×	×	S9123	Cmpl dvs extensor tendon wrist	×	×	✓	×
N385	Acquired deformity spine NOS	✓	×	×	×	S9124	Cmpl dvs flexor tendon wrist	×	×	✓	×
N386	Pelvic obliquity	×	✓	×	×	S9125	Part dvs extensor tendon wrist	×	×	✓	×
N387	Cauliflower ear	×	×	×	×	S9126	Part dvs flexor tendon wrist	×	×	✓	×
N388	Spondylolysis	✓	×	×	×	S912z	Opn.wnd.lower arm+tendon NOS	×	×	✓	×
N38y0	Acquired clavicle deformity	×	×	✓	×	S9131	Degloving injury, elbow area	×	×	✓	×
N390	Nonallopathic lesion-head reg	×	×	×	✓	S9132	Degloving injury wrist, volar	×	×	✓	×
N391	Nonallopathic lesion-cervical	✓	×	×	✓	S9133	Degloving injury wrist, dorsum	×	×	✓	×
N392	Nonallopathic lesion-thoracic	✓	×	×	✓	S91z	Opn.wnd.elb./forearm/wrist NOS	×	×	✓	×
N393	Nonallopathic lesion-lumbar	✓	×	×	✓	S92	Open wound hand excl.finger(s)	×	×	✓	×
N394	Nonallopathic lesion-sacral	✓	×	×	✓	S920	Open wound hand-no complic.	×	×	✓	×
N395	Nonallopathic lesion-pelvic	×	✓	×	✓	S9200	Open wound of hand, palm	×	×	✓	×
N396	Nonallopathic lesion-legs	×	✓	×	✓	S9201	Open wound of hand, dorsum	×	×	✓	×
N397	Nonallopathic lesion-arms	×	×	✓	✓	S921	Open wound hand+complication	×	×	✓	×
N398	Nonallopathic lesion-rib cage	✓	×	×	✓	S922	Open wound hand+tendon involv.	×	×	✓	×
N399	Nonallopathic lesion-abd.+oth.	×	×	×	✓	S9220	Cmpl dvs extensor tendon hand	×	×	✓	×
N3y01	Subluxatn complex (vertebral)	✓	×	×	×	S9221	Cmpl dvs flexor tendon hand	×	×	✓	×
N3y02	Sublux stenos of neural canal	✓	×	×	×	S9222	Part dvs extensor tendon hand	×	×	✓	×
N3y03	Osseous stenos of neural canal	✓	×	×	×	S9223	Partial dvs flexor tendon hand	×	×	✓	×
N3y04	Connect tiss sten neural canal	✓	×	×	×	S923	Degloving injury hand	×	×	✓	×
N3y05	Intervert disc sten neur canal	✓	×	×	×	S9230	Degloving injury hand, palmar	×	×	✓	×
N3y06	Oss/sublx sten intervert foram	✓	×	×	×	S9231	Degloving injury hand, dorsum	×	×	✓	×
N3y07	Con tis/disc sten intervrt for	✓	×	×	×	S924	Severe multi tiss damage hand	×	×	✓	×
Nyu21	[X]Other primary coxarthrosis	×	✓	×	×	S925	Massive multi tiss damage hand	×	×	✓	×
Nyu22	[X]Oth dysplastic coxarthrosis	×	✓	×	×	S92z	Open wound hand excl.fing.NOS	×	×	✓	×
Nyu23	[X]Oth post-traum coxarthrosis	×	✓	×	×	S93	Open wound of finger(s) or thumb	×	×	✓	×
Nyu24	[X]Oth 2ndry coxarthrsis,bilat	×	✓	×	×	S9300	Open wound finger	×	×	✓	×
Nyu25	[X]Unilat primary gonarthrosis	×	✓	×	×	S9302	Open wound thumb	×	×	✓	×
Nyu26	[X]Oth post-traum gonarthrosis	×	✓	×	×	S932	Open wound finger+tendon inj.	×	×	✓	×
Nyu27	[X]Oth 2ndry gonarthrsis,bilat	×	✓	×	×	S9322	Cmpl dvsn,both flxr tendons	×	×	✓	×

Read Code	Read Term	Axial	Lower Limb	Upper Limb	Clinician Defined	Read Code	Read Term	Axial	Lower Limb	Upper Limb	Clinician Defined
Nyu28	[X]Unilat second gonarthrosis	×	✓	×	×	S9323	Cmpl dvsn,ext digit tendon	×	×	✓	×
Nyu29	[X]O p arthros/1st crpmtcrp jt	×	×	✓	×	S932A	Part dvsn both flxr tendons	×	×	✓	×
Nyu2A	[X]O p-trm arthro/1st cpmcp jt	×	×	✓	×	S932B	Part dvsn,ext digit tendon	×	×	✓	×
Nyu2B	[X]O 2ndy arthros/1st cmc j,bi	×	×	✓	×	S937	Open wound finger damage nail	×	×	✓	×
Nyu2C	[X]O 2ndry arthros/1st cpmcp j	×	×	✓	×	S93z	Open wound finger NOS	×	×	✓	×
Nyu2D	[X]Other specified arthrosis	×	×	×	×	S942	Mult./unsp.opn.wnd.arm+tendon	×	×	✓	×
Nyu2E	[X]Oth secondary coxarthrosis	×	✓	×	×	S9504	Traumatic amputation thumb tip	×	×	✓	×
Nyu30	[X]Oth deformity/hallux(acqd)	×	✓	×	×	S96	Traumatic amputation of finger(s)	×	×	✓	×
Nyu31	[X]Oth hammer toe(s)(acquired)	×	✓	×	×	S960	Traumat.amput.finger-no compl.	×	×	✓	×
Nyu32	[X]Oth deformits/toe(s)(acqd)	×	✓	×	×	S9605	Tr ampufingermultiple	×	×	✓	×
Nyu33	[X]Oth acqd deforms/ankle+foot	×	✓	×	×	S9606	Traumatic amputation finger tip	×	×	✓	×
Nyu34	[X]Oth spcf acqd deform/limbs	×	×	×	×	S97	Traumatic amputation arm/hand	×	×	✓	×
Nyu35	[X]Other derangements/patella	×	✓	×	×	S9y	Open wound upper limb OS	×	×	✓	×
Nyu36	[X]Other disorders of patella	×	✓	×	✓	SA	Laceration - leg	×	✓	×	×
Nyu37	[X]Other meniscus derangements	×	✓	×	×	SA0	Open wound hip and thigh	×	✓	×	×
Nyu38	[X]O spontn disrptn/lig(s)knee	×	✓	×	×	SA00	Open wound hip/thigh-no compl.	×	✓	×	×
Nyu39	[X]Oth intrnl derangemnts/knee	×	✓	×	×	SA1	Open wound knee/leg/ankle	×	✓	×	×
Nyu3B	[X]O spcf joint derangmnts,NEC	×	×	×	×	SA100	Open wound of knee	×	✓	×	×
Nyu3C	[X]Other instability of joint	×	×	×	×	SA101	Open wound of leg	×	✓	×	×
Nyu3D	[X]Other spcfd joint disorders	×	×	×	×	SA110	Open wound knee+complication	×	✓	×	×
Nyu3E	[X]Disorder of patella, unspec	×	✓	×	✓	SA131	Degloving injury lower leg	×	✓	×	×
Nyu5	[X]Deforming dorsopathies	✓	×	×	×	SA17	Open Wound - Ankle	×	✓	×	×
Nyu50	[X]Other secondary kyphosis	✓	×	×	×	SA1z	Open wound knee/leg/ankle NOS	×	✓	×	×
Nyu51	[X]Other+unspecified kyphosis	✓	×	×	×	SA2	Open wound foot excl.toe(s)	×	✓	×	×
Nyu52	[X]Other lordosis	✓	×	×	×	SA203	Open wound heel	×	✓	×	×
Nyu53	[X]Other idiopathic scoliosis	✓	×	×	×	SA2z	Open wound foot NOS	×	✓	×	×
Nyu54	[X]Other secondary scoliosis	✓	×	×	×	SA3	Open wound of toe(s)	×	✓	×	×
Nyu55	[X]Other forms of scoliosis	✓	×	×	×	SA31	Open wound toe(s)+complication	×	✓	×	×
Nyu56	[X]Other fusion of spine	✓	×	×	×	SA3z	Open wound of toe(s) NOS	×	✓	×	×
Nyu57	[X]O recur atlantoaxl subluxtn	✓	×	×	×	SA7z	Traumatic amputation - leg NOS	×	✓	×	×
Nyu58	[X]Oth recur vertebrl subluxtn	✓	×	×	×	SC00	Late effect-#skull/face bones	×	×	×	×
Nyu59	[X]Oth spcf deform dorsopaths	✓	×	×	×	SC01	Late effect-#spine-no cord les	✓	×	×	×
Nyu5A	[X]Lordosis, unspecified	✓	×	×	×	SC010	Late effect # cervic vertebra	✓	×	×	×
Nyu5B	[X]Spin osteochondrosis, unsp	✓	×	×	×	SC011	Late effect # thoracic vert	✓	×	×	×
Nyu6	[X]Spondylopathies	✓	×	×	✓	SC012	Late effect # lumbar vertebra	✓	×	×	×
Nyu60	[X]Oth infectv spondylopathies	✓	×	×	×	SC02	Late effect-#arm	×	×	✓	×
Nyu61	[X]Oth spcf inflam spondylpath	✓	×	×	×	SC03	Late effect-# neck of femur	×	✓	×	×
Nyu62	[X]Oth spondylosis+myelopathy	✓	×	×	×	SC04	Late effect-other #leg	×	✓	×	×
Nyu63	[X]O spondylosis+radiculopathy	✓	×	×	×	SC09	Late effect-traumatic amputatn	×	×	×	×
Nyu64	[X]Other spondylosis	✓	×	×	✓	SC0X	Seq oth fract thorax/pelvis	✓	×	×	×
Nyu65	[X]Other spcfd spondylopathies	✓	×	×	✓	SC0z	Delayed union of fracture	×	×	×	×
Nyu66	[X]Spondylpth/o inf+paras d CE	✓	×	×	×	SD097	SuperficialInjury:Neck	✓	×	×	×
Nyu67	[X]Collapsd vertebra in dis CE	✓	×	×	×	SD0y	Superficial injury of head NOS	×	×	×	×
Nyu68	[X]Spondylpthy/oth diseases CE	✓	×	×	✓	SD0y0	Superficial injury of face NOS	×	×	×	×

Read Code	Read Term	Axial	Lower Limb	Upper Limb	Clinician Defined	Read Code	Read Term	Axial	Lower Limb	Upper Limb	Clinician Defined
Nyu7	[X]Other dorsopathies	✓	×	×	✓	SD1y1	Sup inj chst w NOS-no mj op wd	✓	×	×	×
Nyu70	[X]Oth cervicl disc displacmnt	✓	×	×	✓	SD1y4	Supl inj bk NOS-no mj opn wnd	✓	×	×	×
Nyu71	[X]Oth cervicl disc degeneratn	✓	×	×	✓	SD2y0	Superfic injury shoulder NOS	×	×	✓	×
Nyu72	[X]Oth cervical disc disorders	✓	×	×	✓	SD2y1	Superficial injury of scapular NOS	×	×	✓	×
Nyu73	[X]Lumb+o intrvrt disc d+mylop	✓	×	×	×	SD3	Superf.inj.elbow/forearm/wrist	×	×	✓	×
Nyu74	[X]Lumb+o intvt disc d+radiclp	✓	×	×	✓	SD3y0	Superficial injury of elbow NOS	×	×	✓	×
Nyu75	[X]O spc intervert disc displm	✓	×	×	✓	SD3y1	Superficial injury of forearm NOS	×	×	✓	×
Nyu76	[X]O spc intrvrtbl disc degenr	✓	×	×	✓	SD3y2	Superficial injury of wrist NOS	×	×	✓	×
Nyu77	[X]O spcf intrvrtbrl disc diso	✓	×	×	✓	SD4	Superf.inj.handexcl.fingers	×	×	✓	×
Nyu78	[X]Sacrococygeal disorders,NEC	✓	×	×	✓	SD4y	Superf.inj.-handNOSnoinf.	×	×	✓	×
Nyu79	[X]Oth specified dorsopathies	✓	×	×	✓	SD4z	Superf.inj.-hand NOS+infect.	×	×	✓	×
Nyu7A	[X]Other dorsalgia	✓	×	×	✓	SD5	Superficial injury finger(s)	×	×	✓	×
Nyu7B	[X]Cervical disc disord, unsp	✓	×	×	✓	SD5z	Superfic.inj.-finger NOS+inf.	×	×	✓	×
NyuA0	[X]Other bursitis of elbow	×	×	✓	✓	SD6	Superficial inj.leg excl.foot	×	✓	×	×
NyuA1	[X]Other bursitis of knee	×	✓	×	✓	SD6y	Superfic.injury-legNOSnoinf	×	✓	×	×
NyuA2	[X]Other bursitis of hip	×	✓	×	✓	SD6y2	SuperficialinjuryofkneeNOS	×	✓	×	×
NyuAB	[X]Other shoulder lesions	×	×	✓	✓	SD6y3	Superficial injury lwr leg NOS	×	✓	×	×
NyuAC	[X]O enthespath/lw limb,exc ft	×	✓	×	✓	SD6y4	Superficial injury of ankle NOS	×	✓	×	×
NyuAD	[X]Other enthesopathy of foot	×	✓	×	✓	SD7y0	Superficial injury of foot NOS	×	✓	×	×
NyuAJ	[X]Enthesopathy lowr limb,unsp	×	✓	×	✓	SD7y1	Superficial injury of toe NOS	×	✓	×	×
NyuD0	[X]O juv osteochndrsis/hp+pelv	×	✓	×	×	SE00	Contusion forehead	×	×	×	×
NyuD1	[X]O juv osteochndrsis/up limb	×	×	✓	×	SE01	Contusion cheek	×	×	×	×
R01z1	[D]Growing pains - limbs	×	×	×	✓	SE08	Other contusion neck	✓	×	×	×
R0224	[D]Loc swell mass/lump up limb	×	×	✓	×	SE0z	Contusion face scalp+neck NOS	✓	×	×	×
R0225	[D]Loc swell mass/lump low limb	×	✓	×	×	SE11	Contusioneyelids+perioc tiss	×	×	×	×
R0229	[D]Foot lump	×	✓	×	×	SE20	Contusion breast	✓	×	×	×
R022A	[D]Shoulder lump	×	×	✓	×	SE21	Contusion chest wall	✓	×	×	×
R022B	[D]Lump on hand	×	×	✓	×	SE22z	Contusion abdominal wall NOS	×	×	×	×
R022C	[D]Lump on knee	×	✓	×	×	SE23	Contusion back	✓	×	×	×
R022D	[D]Lump on leg	×	✓	×	×	SE231	Contusion buttock	×	✓	×	×
R022F	[D]Lump on thigh	×	✓	×	×	SE232	Contusion of lower back	✓	×	×	×
R022G	[D]Finger lump	×	×	✓	×	SE233	Contusion of coccyx	✓	×	×	×
R022H	[D]Wrist lump	×	×	✓	×	SE23z	Contusion back NOS	✓	×	×	×
R022K	[D]Buttock swelling	×	✓	×	×	SE241	Contusion penis	×	×	×	×
R04	[D]Head and neck symptoms	✓	×	×	✓	SE242	Contusion scrotum or testis	×	×	×	×
R0400	[D]Facial pain	×	×	×	✓	SE25	Contusion of pelvic region	×	✓	×	×
R040z	[D]Jaw pain	×	×	×	✓	SE3	Arm bruise	×	×	✓	×
R042	[D]Neck swelling/mass/lump	✓	×	×	×	SE30	Contusion shoulder or upper arm	×	×	✓	×
R0420*	[D]Swelling face	×	×	×	×	SE300	Contusion shoulder area	×	×	✓	×
R0422	[D]Lump in head or neck	✓	×	×	×	SE303	Contusion upper arm	×	×	✓	×
R04z*	[D]Head and neck other sympt.	×	×	×	✓	SE31	Contusion elbow or forearm	×	×	✓	×
R04zz	[D]Head and neck symptoms NOS	✓	×	×	✓	SE310	Contusion forearm area	×	×	✓	×
R065	[D]Chest pain	✓	×	×	✓	SE311	Contusion elbow area	×	×	✓	×
R0650	[D] Retrosternal chest pain	✓	×	×	✓	SE31z	Contusion elbow and forearm NOS	×	×	✓	×

Read Code	Read Term	Axial	Lower Limb	Upper Limb	Clinician Defined
R0652	[D]Anterior chest wall pain	✓	×	×	✓
R0659	[D]Parasternal chest pain	✓	×	×	✓
R065A	[D]Musculoskeletal chest pain	✓	×	×	✓
R065B	[D]Non cardiac chest pain	✓	×	×	✓
R065C	[D]Retrosternal chest pain	✓	×	×	✓
R065D	[D]Central chest pain	✓	×	×	✓
R065z	[D]Chest pain NOS	✓	×	×	✓
R066	[D]Swelling mass lump chest	✓	×	×	×
R0661	[D]Chest lump	✓	×	×	×
R090B	[D]Groin pain	×	✓	×	✓
R090C	[D]Loin pain	✓	×	×	✓
R090G	[D] Pelvic pain	×	✓	×	✓
R090J	[D]Right upper quadrant pain	✓	×	×	✓
R090K	[D]Left upper quadrant pain	✓	×	×	✓
R1300	[D]Skull/head x-ray abnormal	×	×	×	×
Ryu04	[X]Other chest pain	✓	×	×	✓
S0	Fracture of skull	×	×	×	×
S00	Parietal bone fracture	×	×	×	×
S00z	#Skull vault NOS	×	×	×	×
S01	Temporal bone fracture	×	×	×	×
S010	Cls # bse skl wtout intrcr inj	×	×	×	×
S011	Cls # base skl wth intrcrn inj	×	×	×	×
S01z	#Base of skull NOS	×	×	×	×
S02	Fracture of face bones	×	×	×	×
S020	Closed fracture nose	×	×	×	×
S021	Open fracture nose	×	×	×	×
S022	Fracture of lower jaw, closed	×	×	×	×
S023	Fracture of lower jaw, open	×	×	×	×
S0230	Open # mandible (site unsp)	×	×	×	×
S0238	Op#mandible-bodyother+unspec.	×	×	×	×
S024	Fracture of upper jaw, closed	×	×	×	×
S0240	Closed fracture maxilla	×	×	×	×
S0241	Closed fracture zygoma	×	×	×	×
S025	Fracture of upper jaw, open	×	×	×	×
S0250	Open fracture maxilla	×	×	×	×
S0251	Open fracture zygoma	×	×	×	×
S027	Open orbital blow-out fracture	×	×	×	×
S028	Fracture of skull+facial bones	×	×	×	×
S0280	Fracture of nasal bones	×	×	×	×
S0281	Fracture of orbital floor	×	×	×	×
S0282	Fracture/malar+maxillary bones	×	×	×	×
S0283	Fracture of mandible	×	×	×	×
S02A	Le Fort I fracture maxilla	×	×	×	×
S02B	Le Fort II fracture maxilla	×	×	×	×
SE320	Contusion hand excluding finger	×	×	✓	×
SE321	Contusion wrist	×	×	✓	×
SE322	Contusion hand palm	×	×	✓	×
SE323	Contusion hand dorsum	×	×	✓	×
SE32z	Contusion wrist and hand NOS	×	×	✓	×
SE330	Contusion finger unspecified	×	×	✓	×
SE33z	Contusion finger NOS	×	×	✓	×
SE3z	Contusion upper limb NOS	×	×	✓	×
SE4	Leg bruise	×	✓	×	×
SE40	Contusion hip and thigh	×	✓	×	×
SE400	Contusion hip	×	✓	×	×
SE401	Contusion thigh	×	✓	×	×
SE41	Bruise - knee/lower leg	×	✓	×	×
SE410	Contusion lower leg	×	✓	×	×
SE411	Contusion knee	×	✓	×	×
SE42	Contusnankle+footexc toe(s)	×	✓	×	×
SE420	Contusion foot	×	✓	×	×
SE421	Contusion ankle	×	✓	×	×
SE42z	Contusion ankle and foot NOS	×	✓	×	×
SE43	Contusion toe	×	✓	×	×
SE45	Contusion lower limb NOS	×	✓	×	×
SE46	Traumatic haematoma	×	×	×	×
SF021	Crush injury larynx	✓	×	×	×
SF100	Crush injury penis	×	×	×	×
SF101	Crush injury scrotum and testis	×	×	×	×
SF10z	Crush injuryext genitalia NOS	×	×	×	×
SF110	Crushinjuryback	✓	×	×	×
SF111	Crush injury buttock	×	✓	×	×
SF2	Crush injury of arm	×	×	✓	×
SF20z	CrushinjuryshIder+uparmNOS	×	×	✓	×
SF210	Crushinjuryforearm	×	×	✓	×
SF22	Crush injury wrist or hand	×	×	✓	×
SF220	Crush injuryhandexcl fingers	×	×	✓	×
SF23	Crush injury finger(s)	×	×	✓	×
SF230	Closed crush injury finger	×	×	✓	×
SF231	Closed crush injury thumb	×	×	✓	×
SF233	Open crush injury finger	×	×	✓	×
SF234	Open crush injury thumb	×	×	✓	×
SF2y	Crush injury arm multiple sites	×	×	✓	×
SF3	Crush injury lower limb	×	✓	×	×
SF300	Crushinjurythigh	×	✓	×	×
SF301	Crushinjuryhip	×	✓	×	×
SF304	Closed crush injury hip	×	✓	×	×
SF310	Crushinjurylowerleg	×	✓	×	×

Read Code	Read Term	Axial	Lower Limb	Upper Limb	Clinician Defined	Read Code	Read Term	Axial	Lower Limb	Upper Limb	Clinician Defined
S02C	Le Fort III fracture maxilla	×	×	×	×	SF311	Crush injury knee	×	✓	×	×
S02x1	#Orbit NOS - closed	×	×	×	×	SF320	Crush injury foot	×	✓	×	×
S02z	#Facial bone NOS	×	×	×	×	SF321	Crush injury ankle	×	✓	×	×
S03	Other/unqualif.skull fractures	×	×	×	×	SF32z	Crush injury ankle and foot NOS	×	✓	×	×
S030	Closed #skull NOS - no i/c inj	×	×	×	×	SF33	Crush injury toe(s)	×	✓	×	×
S031	Closed #skull NOS + i/c inj.	×	×	×	×	SJ30	Cervicalnerverootinjury	✓	×	×	×
S032	Open #skull NOS - no i/c inj.	×	×	×	×	SJ305	Cervical nerve root injury - C6	✓	×	×	×
S033	Open #skull NOS + i/c inj.	×	×	×	×	SJ306	Cervical nerve root injury - C7	✓	×	×	×
S03z	Skull fracture NOS	×	×	×	×	SJ34	Brachialplexusinjury	✓	×	✓	×
S04	Multiple skull fractures	×	×	×	×	SJ43	Latrl cutaneous branch T12 inj	✓	×	×	×
S040	Mult.#skull,closed-no i/c inj.	×	×	×	×	SJ513	Open injury median nerve	×	×	✓	×
S041	Mult.#skull,closed + i/c inj.	×	×	×	×	SJ52	Ulnarnerveinjury	×	×	✓	×
S042	Mult.#skull,open-no i/c inj.	×	×	×	×	SJ520	Closedinjuryulnarnerve	×	×	✓	×
S043	Mult.#skull,open + i/c inj.	×	×	×	×	SJ528	Inj/ulnar nerve/wrist+hand lev	×	×	✓	×
S044	Mult fractur inv skul+fac bone	×	×	×	×	SJ534	Inj/radial nerv/wrist+hand lev	×	×	✓	×
S04z	Mult.skull+other bone # NOS	×	×	×	×	SJ56	Digital nerve injury	×	×	✓	×
S0z	Fracture of skull NOS	×	×	×	×	SJ564	Opn injdigital nerve in fingr	×	×	✓	×
S1	Fracture of neck and trunk	✓	×	×	×	SJ566	Injury of digital nerve of thumb	×	×	✓	×
S10	#Spine - no cord lesion	✓	×	×	×	SJ60	Sciaticnerveinjury	×	✓	×	×
S100	Closed # cervical spine	✓	×	×	×	SJ63	Peroneal nerve injury	×	✓	×	×
S1000	Clsd # unsp cerv vertebra	✓	×	×	×	SJ642	Cls inj lat cutan nerve thigh	×	✓	×	×
S1001	Closed fracture atlas	✓	×	×	×	SJB0	Injury/ulnarnerve/upparmlev	×	×	✓	×
S1002	Closed fracture axis	✓	×	×	×	SK0y1	Compartment syndrome forearm	×	×	✓	×
S1003	Clsd # third cerv vertebra	✓	×	×	×	SK0y5	Compartmentsyndromeleg	×	✓	×	×
S1004	Clsd # fourth cerv vertebra	✓	×	×	×	SK100	Other cheek injuries	×	×	×	×
S1005	Clsd # fifth cerv vertebra	✓	×	×	×	SK101	Other ear injuries	×	×	×	×
S1006	Clsd # sixth cerv vertebra	✓	×	×	×	SK103	Other lip injuries	×	×	×	×
S1007	Clsd # seventh cerv vertebra	✓	×	×	×	SK104	Other mouth injuries	×	×	×	×
S1008	Cls # atlas-isol arch/art prcs	✓	×	×	×	SK105	Other nose injuries	×	×	×	×
S1009	Clsd # atlas, comminuted	✓	×	×	×	SK109	Scalp injury	×	×	×	×
S100A	Clsd # axis, odontoid process	✓	×	×	×	SK10x	Other face injuries	×	×	×	×
S100B	Clsd # axis, spondylolysis	✓	×	×	×	SK10y	Other neck injuries	✓	×	×	×
S100C	Clsd # axis, spinous process	✓	×	×	×	SK10z	Other face/neck injuries NOS	✓	×	×	×
S100D	Clsd # axis, transvrse process	✓	×	×	×	SK11	Othertrunkinjuries	✓	×	×	×
S100E	Clsd # axis, posterior arch	✓	×	×	×	SK110	Other chest wall injuries	✓	×	×	×
S100F	Clsd # axis, tricolumnar	✓	×	×	×	SK112	Other interscapular injuries	×	×	✓	×
S100G	Clsd # cerv vert, burst	✓	×	×	×	SK113	Other buttock injuries	×	✓	×	×
S100H	Clsd # cerv vert, wedge	✓	×	×	×	SK114	Other back injuries	✓	×	×	×
S100J	Cls # cerv vert, spondylolysis	✓	×	×	×	SK115	Other abdominal wall injuries	×	×	×	×
S100K	Cls # cerv vert, spinous prcss	✓	×	×	×	SK116	Other flank injuries	✓	×	×	×
S100L	Cls # cerv vert, trnsvrse prcs	✓	×	×	×	SK117	Other groin injuries	×	✓	×	×
S100M	Cls # cerv vert, post arch	✓	×	×	×	SK11z	OthertrunkinjuriesNOS	✓	×	×	×
S100N	Cls # cerv vert, tricolumnar	✓	×	×	×	SK121	Other scapular region injuries	×	×	✓	×
S100x	Multiple clsd # cerv vert	✓	×	×	×	SK122	Other shoulder injuries	×	×	✓	×

Read Code	Read Term	Axial	Lower Limb	Upper Limb	Clinician Defined
S100z	Clsd # cerv spine NOS	✓	×	×	×
S101	Open fracture cervical spine	✓	×	×	×
S1010	Open # unsp cerv vertebra	✓	×	×	×
S1011	Open fracture atlas	✓	×	×	×
S1012	Open fracture axis	✓	×	×	×
S1013	Open # third cerv vertebra	✓	×	×	×
S1014	Open # fourth cerv vertebra	✓	×	×	×
S1015	Open # fifth cerv vertebra	✓	×	×	×
S1016	Open # sixth cerv vertebra	✓	×	×	×
S1017	Open # seventh cerv vert	✓	×	×	×
S1018	Opn # atlas-isol arch/art prcs	✓	×	×	×
S1019	Open # atlas, comminuted	✓	×	×	×
S101A	Open # axis, odontoid prcss	✓	×	×	×
S101B	Open # axis, spondylolysis	✓	×	×	×
S101C	Open # axis, spinous procss	✓	×	×	×
S101D	Opn # axis, trnsvrse process	✓	×	×	×
S101E	Open # axis, posterior arch	✓	×	×	×
S101F	Open # axis, tricolumnar	✓	×	×	×
S101G	Open # cerv vert, burst	✓	×	×	×
S101H	Open # cerv vert, wedge	✓	×	×	×
S101J	Opn # cerv vert, spondylolysis	✓	×	×	×
S101K	Opn # cerv vert, spinous prcs	✓	×	×	×
S101L	Opn # cerv vert, trnsvrse prcs	✓	×	×	×
S101M	Opn # cerv vert, post arch	✓	×	×	×
S101N	Opn # cerv vert, tricolumnar	✓	×	×	×
S101x	Multiple open # cerv vert	✓	×	×	×
S101z	Open # cerv spine NOS	✓	×	×	×
S102	Closed fracture thoracic vertebra	✓	×	×	×
S1020	Clsd # thoracic vert, burst	✓	×	×	×
S1021	Clsd # thoracic vert wedge	✓	×	×	×
S1022	Cls # thorc vert-spondylolysis	✓	×	×	×
S1023	Clsd # thor vert-spinous prcss	✓	×	×	×
S1024	Clsd # thorc vert-trnsvrs prcs	✓	×	×	×
S1025	Clsd # thorc vert - post prcs	✓	×	×	×
S1026	Clsd # thorc vert - tricolumnr	✓	×	×	×
S102y	Othr spec clsd # thorac vert	✓	×	×	×
S102z	Clsd # thorac vert NOS	✓	×	×	×
S103	Open # thoracic vertebra	✓	×	×	×
S1030	Open # thorac vert, burst	✓	×	×	×
S1031	Open # thorac vert, wedge	✓	×	×	×
S1032	Opn # thorc vert-spondylolysis	✓	×	×	×
S1033	Opn # thorc vert-spinous prcs	✓	×	×	×
S1034	Opn # thorc vert-trnsvrse prcs	✓	×	×	×
S1035	Opn # thor vert-posterior arch	✓	×	×	×
SK12z	Othershould/upperarminj.NOS	×	×	✓	×
SK13	Other elbow/forearm/wrist inj.	×	×	✓	×
SK130	Other elbow injuries	×	×	✓	×
SK131	Injury arm	×	×	✓	×
SK132	Other wrist injuries	×	×	✓	×
SK133	Unspecified injury of wrist	×	×	✓	×
SK14	Other hand injury (exc.finger)	×	×	✓	×
SK140	Unspecified injury of hand	×	×	✓	×
SK15	Other finger injuries	×	×	✓	×
SK150	Other finger injuries unsp.	×	×	✓	×
SK151	Otherfingernailinjuries	×	×	✓	×
SK152	Other thumb injuries unsp.	×	×	✓	×
SK154	Finger injury	×	×	✓	×
SK15z	Other finger injuries NOS	×	×	✓	×
SK160	Other hip injuries	×	✓	×	×
SK161	Other thigh injuries	×	✓	×	×
SK17	Injury toe	×	✓	×	×
SK170	Other knee injury	×	✓	×	×
SK171	Other leg injury	×	✓	×	×
SK172	Other ankle injury	×	✓	×	×
SK173	Other foot injury	×	✓	×	×
SK174	Calf injury	×	✓	×	×
SK175	Injury of lower leg	×	✓	×	×
SK17z	Knee/leg/ankle/foot injury NOS	×	✓	×	×
SK1D0	Inj/adductor musc+tendon/thigh	×	✓	×	×
SK1E	Inj/musc+tendon/lower leg levl	×	✓	×	×
SK1x8	Multiple open wounds of lower leg	×	✓	×	×
SP04	Hipprosthesisloose	×	✓	×	×
SP04a	Dislocation hip joint prosthes	×	✓	×	×
SP04z	Hip prosthesis loose	×	✓	×	×
SR10	Fracture involv head with neck	✓	×	×	×
SR100	Cls fract invol head with neck	✓	×	×	×
SR101	Op fract invol head with neck	✓	×	×	×
SR11	Fractr inv thrx wth lw bck+plv	✓	×	×	×
SR12	Fractur inv mult reg/1 upp lmb	×	×	✓	×
SR120	Cl fr in mult reg one upp limb	×	×	✓	×
SR121	Op fr in mult reg one upp limb	×	×	✓	×
SR13	Fractur inv multi reg/1 lw lmb	×	✓	×	×
SR14	Fract inv mult reg/both lw lmb	×	✓	×	×
SR140	Cl fr inv mult reg both lw lmb	×	✓	×	×
SR141	Op fr inv mult reg both lw lmb	×	✓	×	×
SR15	Frct inv mult reg/up lmb+l lmb	×	×	×	×
SR150	Cl fr in mult reg up + low lmb	×	×	×	×
SR151	Op fr in mult reg up + low lmb	×	×	×	×

Read Code	Read Term	Axial	Lower Limb	Upper Limb	Clinician Defined
S1036	Opn # thor vert-tricolumnar	✓	×	×	×
S104	Closed fracture lumbar vertebra	✓	×	×	×
S1040	Clsd # lumbar vert, burst	✓	×	×	×
S1041	Clsd # lumbar vert wedge	✓	×	×	×
S1042	Cls # lumbr vert-spondylolysis	✓	×	×	×
S1043	Cls # lumbr vert-spinous prcss	✓	×	×	×
S1044	Cls # lumbr vert-trnsvrse prcs	✓	×	×	×
S1045	Cls # lumb vert-posterior arch	✓	×	×	×
S1046	Clsd # lumb vert - tricolumnar	✓	×	×	×
S105	Open fracture lumbar vertebra	✓	×	×	×
S1050	Open # lumbar vert, burst	✓	×	×	×
S1051	Open # lumbar vert, wedge	✓	×	×	×
S1052	Opn # lumb vert, spondylolysis	✓	×	×	×
S1053	Opn # lumb vert, spinous prcs	✓	×	×	×
S1054	Opn # lumb vert, trnsvrse prcs	✓	×	×	×
S1055	Opn # lumb vert,posterior arch	✓	×	×	×
S1056	Opn # lumb vert, tricolumnar	✓	×	×	×
S106	Closed fracture sacrum	✓	×	×	×
S1060	Clsd compression # sacrum	✓	×	×	×
S1061	Clsd vertical # of sacrum	✓	×	×	×
S107	Open fracture sacrum	✓	×	×	×
S1070	Opn compression # sacrum	✓	×	×	×
S1071	Open vertical # sacrum	✓	×	×	×
S108	Closed fracture pelvis coccyx	✓	×	×	×
S109	Open fracture pelvis, coccyx	✓	×	×	×
S10A	Fracture of neck	✓	×	×	×
S10A0	Fracture/1st cervical vertebra	✓	×	×	×
S10A1	Fracture/2nd cervical vertebra	✓	×	×	×
S10A2	Multip fracture/cervical spine	✓	×	×	×
S10B	Fracture/lumbar spine+pelvis	✓	×	×	×
S10B0	Fracture of lumbar vertebra	✓	×	×	×
S10B1	Fracture of sacrum	✓	×	×	×
S10B2	Fracture of coccyx	✓	×	×	×
S10B3	Fracture of ilium	×	✓	×	×
S10B4	Fracture of acetabulum	×	✓	×	×
S10B5	Fracture of pubis	×	✓	×	×
S10B6	Mult fractur/lumbar spine+pelv	✓	×	×	×
S10x	Closed # spine, unspecif	✓	×	×	×
S10y	Open # spine, unspecif	✓	×	×	×
S10z	#Spine - no cord lesion - NOS	✓	×	×	×
S11	#Vertebra + cord lesion	✓	×	×	×
S110	Closed cervical #+cord lesion	✓	×	×	×
S1100	Clsd # C1-C4 unspec cord les	✓	×	×	×
S1101	Clsd # C1-C4 complete cord les	✓	×	×	×
SR16	Fract/thorx wth lw bck+plv+lmb	✓	✓	×	×
SR160	Cl fract/th wth lw bck+plv+lmb	✓	✓	×	×
SR161	Op fract/th wth lw bck+plv+lmb	✓	✓	×	×
SR20	Disloc,sprns+strns inv hd+neck	✓	×	×	×
SR21	Disl sprn+strn/thrx+lw bck+plv	✓	×	×	×
SR22	Disl,sprn+strn/mult reg up lmb	×	×	✓	×
SR23	Disl sprns+strns/mlt rg lw lmb	×	✓	×	×
SR24	Disl,sprn+strn/mlt reg u+l lmb	×	×	×	×
Syu1	[X]Injuries to the neck	✓	×	×	×
Syu12	[X]Superf inj neck part unsp	✓	×	×	×
Syu15	[X]Fract oth spec cervic vert	✓	×	×	×
Syu16	[X]Fracture other parts neck	✓	×	×	×
Syu17	[X]Disloc oth unsp parts neck	✓	×	×	×
Syu18	[X]Spr/str jt/lg ot/un pt neck	✓	×	×	×
Syu31	[X]Sup inj ab/low back/peluns	✓	×	×	×
Syu3L	[X]Unsp inj abd/low back/pelv	✓	×	×	×
Syu4	[X]Inj to shoulder/upper arm	×	×	✓	×
Syu44	[X]Fract should/upp arm unsp	×	×	✓	×
Syu46	[X]Spr/str oth/un part shl gir	×	×	✓	×
Syu4E	[X]Unspecif inj should/up arm	×	×	✓	×
Syu5	[X]Inj to elbow & forearm	×	×	✓	×
Syu54	[X]Fract of forearm unspecif	×	×	✓	×
Syu5F	[X]Oth spec inj elbow/forearm	×	×	✓	×
Syu5G	[X]Unspecif inj elbow/forearm	×	×	✓	×
Syu6	[X]Injuries to the wrist and hand	×	×	✓	×
Syu63	[X]Fract other carpal bone(s)	×	×	✓	×
Syu64	[X]Fract other metacarpal bone	×	×	✓	×
Syu65	[X]Frac oth uns part wrist/hnd	×	×	✓	×
Syu66	[X]Spr/str ot/uns prt wris/hnd	×	×	✓	×
Syu6C	[X]Inj int mus/tn ot finwt/hd	×	×	✓	×
Syu6M	[X]Unsp injury wrist and hand	×	×	✓	×
Syu7	[X]Injuries to the hip and thigh	×	✓	×	×
Syu72	[X]Fract other parts of femur	×	✓	×	×
Syu8	[X]Inj to knee and lower leg	×	✓	×	×
Syu80	[X]Contus oth uns part low leg	×	✓	×	×
Syu84	[X]Sprn/str oth unsp part knee	×	✓	×	×
Syu9	[X]Injuries to the ankle and foot	×	✓	×	×
Syu94	[X]Fracture of other tarsal bones	×	✓	×	×
Syu96	[X]Sprn/str oth/unsp part foot	×	✓	×	×
Syu9B	[X]Inj oth mus/ten,ank/foot lv	×	✓	×	×
Syu9C	[X]Inj uns mus/ten of ank/foot	×	✓	×	×
SyuB0	[X]Disl/spr/str uns jt/lig trk	✓	×	×	×
SyuB8	[X]Unspecif inj leg lev unsp	×	✓	×	×
SyuBJ	[X]Inj unsp muscle+tendon trnk	✓	×	×	×

Read Code	Read Term	Axial	Lower Limb	Upper Limb	Clinician Defined	Read Code	Read Term	Axial	Lower Limb	Upper Limb	Clinician Defined
S1102	Clsd # C1-C4 ant cord lesion	✓	×	×	×	SyuBK	[X]Dsl spr/stn uns jnt+lig arm	×	×	✓	×

*Codes with multiple clinical terms where alternate terms are located in more than one of the three regions specified in the RRC criteria (axial, upper limb or lower limb).

A5.3 Somatic symptoms Read code list

Table A5.4 Somatic symptom Read codes.

Physical symptom	Read code	Clinical term
Irritable bowel syndrome	J521	Irritable bowel syndrome
	J5210	Irritable bowel syndrome with diarrhoea
Fatigue/tiredness	1682	Fatigue
	R0071	[D]Fatigue
	168	Tiredness symptom
	1683	Tired all the time
	1688	Exhaustion
	R0075	[D]Tiredness
Headache	R040	[D]Headache
	R040z	[D]Pain in head NOS
	1BA8	Temporal headache
	1BAZ	Headache site NOS
	1BB3	Shooting headache
	1BB2	Throbbing headache
	1BBZ	Headache character NOS
	1BA4	Bilateral headache
	1BA3	Unilateral headache
	1BA2	Generalised headache
	1BA5	Frontal headache
	1BA6	Occipital headache
	1BA7	Parietal headache
	1BA9	Sinus headache
	1B1G	C/O - a headache
	E2781	Tension headache
	1BB	Headache character
	1BB1	Aching headache
	1BB4	Morning headache
	1BB5	Heavy head
	Eu454	[X]Persistent somatoform pain disorder (P) Psychogenic headache (S)
	Fyu5D	Cervicogeneic headache
	F2626	[X]Tension-type headache
	Fyu5E	[X]Chronic headache disorder
	F26	Migraine
	F260	Classical migraine
	F261	Common migraine
	F2610	Atypical migraine
	F2611	Sick headache
	F261z	Common migraine NOS
	F262	Migraine variants
	F2620	Cluster headache
	F2621	Horton's (histamine) neuralgia
	F2626	[X]Tension type headache
	F2623	Basilar migraine
	F2624	Ophthalmic migraine
	F2625	Periodic migrainous neuralgia
	F2627	Chronic paroxysmal hemicrania
	F262z	Migraine variant NOS
	F26y	Other forms of migraine
	F26y0	Hemiplegic migraine
	F26y1	Ophthalmoplegic migraine
	F26y2	Status migrainosus
	F26y3	Complicated migraine
	F26yz	Other forms of migraine NOS
	F26z	Migraine NOS
	K584	Premenstrual tension syndrome (P) Migraine - menstrual (S)
Numbness/tingling	R0206	[D]Numbess
	1B44	Has numbness
	R0203	[D]Tingling of skin
	1B43	Has tingling sensation

Physical symptom	Read code	Clinical term
Pain/cramps in the abdomen	R090	[D]Abdominal pain
	R0904	[D]Abdominal cramps
	R090D	[D]Abdominal migraine
	Ryu11	[X]Other and unspecified abdominal pain
	R090z	[D]Abdominal pain NOS
	R090N	[D]Nonspecific abdominal pain
	R090z	[D]Abdominal pain NOS
	1968	Abdominal discomfort
	1969	Abdominal pain
	19690	Abdominal wall pain
	196A	Type of GIT pain NOS
	196	Abdominal pain type
	197A	Generalised abdominal pain
Upper abdominal pain	197B	Upper abdominal pain
	R0905	[D]Epigastric pain
Dizziness	R0040	[D]Dizziness
	1B5	Incoordination symptom (P) Dizziness symptom (S)
	1B52	Unsteadiness present
	1B51	No incoordination
	1B54	Giddiness present
	1B55	Dizziness on standing up
	1B5Z	Incoordination symptom NOS
	R0042	[D]Light-headedness
	R0043	[D]Vertigo NOS
Insomnia	E2741	Transient insomnia
	1B1B	Cannot sleep - insomnia
	1B1B0	Initial insomnia
	1B1B1	Middle insomnia
	1B1B2	Late insomnia
	E2742	Persistent insomnia
	R0052	[D]Insomnia NOS
	R005	[D]Sleep disturbances
	R0050	[D]Sleep disturbance, unspecified
	R0054	[D]Hypersomnia NOS
	R005z	[D]Sleep dysfunction NOS
	1B1Q	Poor sleep pattern
Depression	Eu32z	[X]Depression NOS
	E281	Chronic depression
	E2B0	Postviral depression
	1JJ	Suspected depression
	1B1U	Symptoms of depression
	E2003	Anxiety with depression
	9H90	Depression annual review
	9H92	Deperssion interim review
	Eu412	[X]Mixed anxiety and depressive disorder
	8BK0	Depression management programme
	Eu341	[X]Dysthymia
	Eu32z	[X]Depressive episode, unspecified
	E130	Reactive depressive psychosis
	E204	Neurotic depression reactive type
	E113	Recurrent major depressive episode
	E112	Single major depressive episode
	Eu32	[X]Depressive episode
	Eu33	[X]Recurrent depressive disorder
	Eu315	[X]Bipolar affective disorder current episode severe depression with psyc symp
	Eu314	[X]Bipolar affective disorder current episode severe depression no psychot symptoms
	Eu313	[X]Bipolar affective disorder cur episode mild or moderate depression
Nausea	R0700	[D]Nausea
	198	Nausea
	1982	Nausea present
	1983	Morning nausea

Physical symptom	Read code	Clinical term
Nausea (cont)	1984	Upset stomach
	198Z	Nausea NOS
Constipation	19C	Constipation
	19C2	Constipated
	19CZ	Constipation NOS
	E2645	Psychogenic constipation
	J520	Constipation - functional
	J5200	Acute constipation
	J5201	Chronic constipation with overflow
	J5202	Chronic constipation without overflow
	J5204	Chronic constipation
	J520z	Constipation NOS
Nervousness	R2y2	[D]Nervousness
	E205	Neurasthenia - nervous debility
	E200	Anxiety states
	E2000	Anxiety state unspecified
	E2001	Panic disorder
	E2002	Generalised anxiety disorder
	E2004	Chronic anxiety
	E2005	Recurrent anxiety
	E200z	Anxiety state NOS
	E202	Phobic anxiety
	E2020	Phobia unspecified
	Eu515	[X]Nightmares
	Eu41	[X]Other anxiety disorder
	Eu410	[X]Panic disorder (episodic paroxysmal anxiety)
	Eu411	[X}Generalised anxiety disorder
	Eu413	[X}Other mixed anxiety disorders
	Eu41y	[X]Other specified anxiety disorders
	Eu41z	[X]Anxiety disorder, unspecifie
Chest pain	182	Chest pain
	1822	Central chest pain
	1823	Precordial pain
	1824	Anterior chest wall pain
	1826	Parasternal pain
	1827	Painful breathing - pleurodynia
	1828	Atypical chest pain
	1829	Retrosternal pain
	182B	Rib pain
	182B0	Costal margin chest pain
	182C	Chest wall pain
	182Z	Chest pain NOS
	R065	[D]Chest pain
	R0650	[D]Chest pain, unspecified
	R0651	[D]Precordial pain
	R0652	[D]Anterior chest wall pain
	R0653	[D]Painful respiration NOS
	1825	Pleuritic pain
	R0654	[D]Pleuritic pain
	R0655	[D]Pleurodynia
	R0656	[D]Chest discomfort
	R0657	[D]Chest pressure
	R0658	[D]Chest tightness
	R0659	[D]Parasternal chest pain
	R065A	[D]Musculoskeletal chest pain
	R065B	[D]Non-cardiac chest pain
	R065C	[D]Retrosternal chest pain
	R065D	[D]Central chest pain
	R065z	[D]Chest pain NOS
Fever	165	Temperature symptoms
	1652	Feels hot/feverish
	1653	Fever with sweating
	1657	Hot flushes
	165Z	Temperature symptom NOS

Physical symptom	Read code	Clinical term
Diarrhoea	J43z	Other non-infective gastroenteritis
	19F	Diarrhoea symptoms
	19F2	Diarrhoea
	19F3	Spurious (overflow) diarrhoea
	19FZ	Diarrhoea symptom NOS
	J525	Functional diarrhoea
	E2643	Psychogenic diarrhoea
	19G	Diarrhoea and vomiting
	Eu453	[X]Somatoform autonomic dysfunction (P) Psychogenic diarrhoea (S)
	J4z	Non-infective gastroenteritis NOS
	J4zz	Non-infective gastroenteritis NOS
Dry mouth	1927	Dry mouth
	J0770	Salivary hyposecretion
Itching	1D15	C/O: itching
	Eu45y	[X]Other somatoform disorders (P) Psychogenic pruritis (S)
	M18z	Pruritis NOS
Wheezing	R0609	[D]Wheezing
	1737	Wheezing
	R060E	[D]Mild wheeze
	R060G	[D]Severe wheeze
	R060F	[D]Moderate wheeze
	R060H	[D]Very severe wheeze
Raynaud's phenomenon	G7301	Raynaud's phenomenon
	G730	Raynaud's syndrome
	G7300	Raynaud's disease
	G730z	Raynaud's syndrome NOS
Ringing in ears	1C23	Ringing in ear
	F583	Tinnitus
	F5830	Unspecified tinnitus
	F5831	Subjective tinnitus
	F583z	Tinnitus NOS
	F5832	Objective tinnitus
	1C23	Tinnitus symptoms
	1C22	Buzzing in ear
	1C24	Hissing in ear
	1C25	Roaring in ear
	1C2Z	Tinnitus symptom NOS
Vomiting	R0701	[D]Vomiting
	199	Vomiting
	1992	Vomiting
	199z	Vomiting NOS
	J16y5	Functional vomiting
	J162	Persistent vomiting
	J1620	Cyclical vomiting
	J1621	Habit vomiting
	J162z	Persistent vomiting NOS
	Eu505	[X]Psychogenic vomiting
	E2754	Psychogenic vomiting NOS
	E2642	Cyclical vomiting - psychogenic
Heartburn	R071	[D]Heartburn
	R0711	[D]Waterbrash
	R0710	[D]Pyrosis
	R071z	[D]Heartburn NOS
	1955	Heartburn symptom
	J10y4	Gastro-oesophageal reflux
	J16y4	Dyspepsia
	195	Indigestion symptoms
	1953	Waterbrash
	1954	Indigestion
	1957	Gastric reflux
	1958	Undiagnosed dyspepsia
	195Z	Indigestion symptom NOS

Physical symptom	Read code	Clinical term
Oral ulcers	J082	Mouth ulcer
	J0820	Minor aphthous ulcer
	J0821	Major aphthous ulcer
	J0822	Recurrent aphthous ulcer
	J082z	Oral aphthae NOS
Loss of/change in taste	ZV415	[V]Problem with smell or taste
	1924	Loss of taste
	R0112	[D]Parageusia
	R011z	[D]Smell or taste disorder NOS
	192A	Bad taste in mouth
Seizures	667T	Daily seizures
	R003z	[D]Convulsion NOS
	F132z	Myoclonus NOS
	F2516	Grand mal seizure
	E2015	Hysterical seizures
	667V	Many seizures in a day
	R0034	[D]Nocturnal seizure
	667S	1 to 7 seizures a week
	667Q	1-12 seizures a year
	667R	2-4 seiaures a month
	F2514	Epileptic seizures - tonic
	F2512	Epileptic seizures - clonic
	F2503	Epileptic seizures - akinetic
	F2502	Epileptic seizures - atonic
	F2513	Epileptic seizures - myoclonic
	F2556	Simple partial epileptic seizure
Shortness of breath	R0608	[D}Shortness of breath
	173	Shortness of breath symptom
	1738	Difficulty breathing
	1739	Shortness of breath
	R060A	[D]Dyspnoea
	2322	O/E - dyspnoea
Loss of appetite	R0300	[D]Appetite loss
	1612	Appetite loss - anorexia
	E2756	Non-organic loss of appetite
	Eu50y	[X]Psychogenic loss of appetite
Rash	1D14	C/O: a rash
	2114	O/E - a rash
	M2y42	Vesicular eruption
	2227	O/E - rash present
	2F0	O/E - discoid rash
	R021	[D]Rash and other nonspecific skin eruption
	R021z	[D]Rash and other nonspecific skin eruption NOS
Easy bruising	16B2	Bruises easily
Hair loss	M2400	Alopecia unspecified
	1N02	C/O: hair loss
	M240	Alopecia
	M240z	Alopecia NOS
Frequent urination	1A1	Micturition frequency
	1A12	Frequency of micturition
	1A1Z	Micturition frequency NO
Painful urination	1A55	Dysuria
	R081	[D]Dysuria
	R0810	[D]Painful urination
	R0811	[D]Strangury
	R081z	[D]Dysuria NOS
	E2653	Psychogenic dysuria
Muscle weakness	2832	O/E - paresis (weakness)
	1B3	Motor symptoms
	R0072	[D]Asthenia NOS
Bladder spasms	R0832	[D]Urge incontinence
	1A26	Urge incontinence of urine

Physical symptom	Read code	Clinical term
Hearing difficulties	F59	Hearing loss
	F590	Conductive hearing loss
	F591	Sensorineural hearing loss
	F592	Mixed conductive and sensorineural deafness
	F594	High frequency deafness
	F595	Low frequency deafness
	F957	Mild acquired hearing loss
	F598	Moderate acquired hearing loss
	F599	Severe acquired hearing loss
	F59A	Profound acquired hearing loss
	F59y	Other specified forms of hearing loss
	F59z	Deafness NOS
	1C12	Hearing difficulty
	1C13	Deafness
	1C131	Unilateral deafness
	1C132	Partial deafness
	1C133	Bilateral deafness
	1C16	Deteriorating hearing
	1C1Z	Hearing symptom NOS
	ZV412	[V]Problems with hearing
Dry eyes	1B88	Dry eyes
	F4F14	Dry eye syndrome
Hives/welts	M28z	Urticaria NOS
Muscle pain	N2410	Muscle pain
Blurred vision	R48y0	Blurred vision NOS
Thinking/remembering problem (cognitive impairment)	28E	Cognitive decline
	E2A10	Mild memory disturbance
Sun sensitivity Waking unrefreshed	No associated Read codes found on systematic and semantic searching of Read code browser.	

A5.4 Read codes for FM/CWP differential diagnoses

Table A5.5 Fibromyalgia differential diagnosis Read codes.

Differential diagnosis	Read code	Clinical term
Rheumatoid arthritis	N04*	Inflammatory arthropathy
Systemic lupus erythematosus	N000*	Systemic lupus erythematosus
Muscle pain	N2410	Muscle pain
Polymyalgia rheumatica	N20*	Polymyalgia rheumatica
Ankylosing spondylitis	N100*	Ankylosing spondylitis
	N0450	Juvenile ankylosing spondylitis
Sjögren's	N002*	Sicca (Sjogren's) syndrome
Hypothyroidsim	C04*	Hypothyroidism
	C052*	Chronic lymphocytic thyroiditis (Hashimotos's disease)

*A search was made for consultations coded with these codes and all daughter codes below them in the Read code hierarchy.

A5.5 Frequent attendance in RRCs aged 45+

Table A5.6 Percentage of cases/controls aged 45+ also non-musculoskeletal frequent attenders (top 10%).

	Number (%) of patients also frequent attenders			
	RRC - All	***RRC - Clinician***	***RRC - Rohrbeck***	***Controls***
Top 10% non-MS FAs*	2,412 (34%)	2,075 (35%)	1,105 (37%)	996 (9%)
n	**7,190**	**5,980**	**3,009**	**10,977**

*non-MS FAs: non-musculoskeletal frequent attenders

A5.6 Ambiguous codes sensitivity analysis

Methods

From the list of 5,182 unique musculoskeletal Read codes 584 were unable to be identified as specifically regional or generalised and were therefore classified as ambiguous. Codes classified as ambiguous represented broad clinical terms with the potential to represent either regional or generalised musculoskeletal conditions. In order to establish whether inclusion of ambiguous codes influenced the patients returned by the RRC criteria, a sensitivity analysis was performed to compare the prevalence of RRCs returned when ambiguous codes were included or excluded.

The cases identified by all regional musculoskeletal codes or the clinician defined code set were included in the sensitivity analysis. RRCs identified using the Rohrbeck-2007 code list were not included since the code list was predefined. Controls were defined by the presence or regional pain only and were therefore also not included in the sensitivity analysis.

Ambiguous codes were incorporated into the criteria (see table 5.1) by adapting the final criterion as follows:

> At least four consultations for regional musculoskeletal complaints in total during the five year period: correlates with four consultations for either regional musculoskeletal complaints or ambiguous musculoskeletal codes during the five year period.

Results

The results of the sensitivity analysis for the inclusion of ambiguous codes is shown in Table A5.7. The inclusion of the ambiguous codes appears to have only a small influence on the number of patients returned. Total prevalence increases by between 6 and 9 per 10,000 of the population with the inclusion of ambiguous codes. The addition of ambiguous codes has a greater influence on prevalence in the higher age groups and the female gender, with prevalence increases of between 20 and 28 per 10,000 population in women over 65. Overall however, the differences are minimal with a similar pattern observed for both groups of cases.

Table A5.7 Prevalence (per 10,000 population) for RRC-all and RRC-clinician including and excluding ambiguous codes.

	RRC-all						RRC-clinician					
	Regional codes only			Including ambiguous codes			Regional codes only			Including ambiguous codes		
	Female	**Male**	**Total**	**Female**	**Male**	**Total**	**Female**	**Male**	**Total**	**Female**	**Male**	**Total**
<14	31	41	36	31	43	37	22	13	17	22	13	17
15–24	340	266	303	345	268	306	205	103	154	208	104	156
25–44	873	627	749	880	632	755	648	426	536	652	429	539
45–64	1,704	1,190	1,447	1,718	1,196	1,457	1,420	959	1,189	1,433	964	1,198
65–75	2,098	1,574	1,847	2,119	1,584	1,862	1,810	1,338	1,583	1,830	1,344	1,597
75+	2,298	1,785	2,102	2,326	1,805	2,128	1,808	1,513	1,695	1,829	1,524	1,713
Total	**1,173**	**807**	**993**	**1,184**	**814**	**1,002**	**942**	**624**	**785**	**951**	**627**	**792**

Discussion

The inclusion of ambiguous codes has only a small influence on patients returned. The marginal increases in prevalence observed when ambiguous codes are included suggest that these 585 codes are not used frequently.

Chapter 6 appendix

A6.1 Comparison of two- and three-region RRCs

Table A6.1 Comparison of 2- and 3-region RRC-clinician and RRC-Rohrbeck patients and controls on age, gender, recorded somatic symptoms, MS and non-MS consultation count and proportion who are in the top 10% of attenders (non-MS consultations only) for the years 2005–2009 in the fully registered CiPCA population.

Patient group (identified from fully registered patients in CiPCA population 2005–2009)	Mean age (sd)	Number female (%)	Mean somatic symptom count (sd)	Mean non-MS consultation count (sd)	Mean MS consultation count (sd)	% also non-MS FAs (top 10%)	Total
RRC-clinician-3	60 (15)	2,117 (60%)	3.04 (2.24)	44 (28)	12 (7)	37%	**3,507**
RRC-clinician-2	59 (17)	2,343 (62%)	2.73 (2.07)	38 (24)	10 (6)	29%	**3,800**
RRC-Rohrbeck-3	61 (15)	1,211 (62%)	3.06 (2.36)	44 (28)	14 (8)	39%	**1,946**
RRC-Rohrbeck-2	61 (16)	1,051 (67%)	2.67 (2.15)	39 (23)	11 (7)	30%	**1,577**
Control	46 (21)	10,215 (50%)	1.22 (1.35)	20 (17)	2 (2)	7%	**20,499**

MS: musculoskeletal
FA: Frequent attender

A6.2 Non-specific generalised pain

a. RRC-clinician

Table A6.2 Comparison of RRC-clinician and patients recorded with non-specific pain codes (and the overlap between the two groups) on age, gender, recorded somatic symptoms, MS and non-MS consultation count and proportion who are in the top 10% of attenders (non-MS consultations only) for the years 2005–2009 in the fully registered CiPCA population.

Patient group (identified from fully registered patients in CiPCA population 2005–2009)	Mean age (sd)	% female	% FAs	Somatic symptom count		Consultation count				Total
						Non-MS		*MS*		
				Mean (sd)	Median (IQ)	Mean (sd)	Median (IQ)	Mean (sd)	Median (IQ)	
A. RRC-clinician	59 (16)	61%	33%	2.9 (2.2)	2 (1, 4)	41 (26)	36 (22, 53)	11 (7)	9 (6, 13)	**7,307**
B. NS	60 (18)	67%	27%	2.4 (2.1)	2 (1, 3)	37 (25)	32 (19, 48)	8 (7)	6 (3, 11)	**6,466**
C. RRC not NS	58 (16)	58%	29%	2.7 (2.0)	2 (1, 4)	38 (25)	33 (21, 50)	10 (6)	8 (6, 12)	**5,504**
D. RRC also NS	63 (15)	71%	44%	3.6 (2.4)	3 (2, 5)	48 (28)	43 (29, 61)	14 (8)	12 (9, 17)	**1,803**
E. NS not RRC	58 (19)	65%	21%	2.0 (1.8)	2 (1, 3)	32 (22)	28 (16, 43)	6 (5)	5 (3, 7)	**4,463**

NS: non-specific pain consulter (including OA)
MS: musculoskeletal
FA: Top 10% non-musculoskeletal frequent attender

b. RRC-Rohrbeck

Table A6.3 Comparison of RRC-Rohrbeck and patients recorded with non-specific pain codes (and the overlap between the two groups) on age, gender, recorded somatic symptoms, MS and non-MS consultation count and proportion who are in the top 10% of attenders (non-MS consultations only) for the years 2005–2009 in the fully registered CiPCA population.

Patient group (identified from fully registered patients in CiPCA population 2005–2009)	Mean age (sd)	% female	% FAs	Somatic symptom count		Consultation count				Total
						Non-MS		*MS*		
				Mean (sd)	Median (IQ)	Mean (sd)	Median (IQ)	Mean (sd)	Median (IQ)	
A. RRC-Rohrbeck	61 (15)	64%	35%	2.9 (2.3)	2 (1, 4)	42 (26)	37 (24, 54)	12 (8)	11 (7, 15)	**3,523**
B. NS	60 (18)	67%	27%	2.4 (2.1)	2 (1, 3)	37 (25)	32 (19, 48)	8 (7)	6 (3, 11)	**6,466**
C. RRC not NS	60 (16)	61%	31%	2.6 (2.1)	2 (1, 4)	39 (25)	34 (22, 52)	11 (6)	9 (7, 14)	**2,594**
D. RRC also NS	65 (14)	74%	47%	3.6 (2.5)	3 (2, 5)	49 (28)	45 (30, 62)	16 (9)	14 (10, 19)	**929**
E. NS not RRC	59 (18)	65%	24%	2.3 (2.0)	2 (1, 3)	35 (24)	30 (18, 46)	7 (6)	5 (3, 9)	**5,537**

NS: non-specific pain consulter (including OA)
MS: musculoskeletal
FA: Top 10% non-musculoskeletal frequent attender